भारतीय मानक
Indian Standard

IS 19014 : 2022

घरेलू उपयोग के कुकिंग उपस्कर — विद्युत हॉब की कार्यकारित अपेक्षाएं

Household Electric Cooking Appliances — Performance Requirements of Electric Hobs

ICS 97.040.20

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Electrical Appliances Sectional Committee, ETD 32

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrical Appliances Sectional Committee had been approved by the Electrotechnical Division Council.

This standard covers the performance requirements of all types of electric hobs for household use, also commercially known as induction stoves and cook tops. The general and safety requirements are covered in IS 302 (Part 2/Sec 6).

The methods for measuring performances of ovens shall be covered in a different standard (*under consideration).*

This standard specifies the measurement procedure reflecting a household-like cooking process for measuring the energy consumption. Following the new market trend, requirements related to flexible and free induction zones known as cooking areas are also included in this standard. The standard specifies standardized cookware, however alternative cookware to facilitate testing are also specified.

While formulating this draft standard, considerable assistance has been drawn from the following:

1) IEC 60350-2 : 2017, 'Household electric cooking appliances — Part 2: Hobs — Methods for measuring performance' issued by International Electrotechnical Commission (IEC) with the following major modifications:
    a) Requirements are specified for the method of tests given;
    b) Requirements and test method for thermal efficiency is added;
    c) Marking requirements are included; and
    d) Schedule of routine, acceptance and type tests have been included.

2) Bureau of Energy Efficiency (BEE) recommendations for energy consumption of hobs, standby power and thermal efficiency.

The composition of the technical committee responsible for formulation of this standard is listed in Annex H.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HOUSEHOLD ELECTRIC COOKING APPLIANCES — PERFORMANCE REQUIREMENTS OF ELECTRIC HOBS

1 SCOPE

This standard specifies performance requirements of electric hobs for household use, their rated voltage being not more than 250 V for single-phase appliances connected between one phase and neutral, and 415 V for three-phase appliances.

Appliances covered by this standard can be built-in or designed to be placed on a work surface. The hob can also be a part of a cooking range.

This standard defines the main performance characteristics of hobs which are of interest to the user and specifies methods for measuring these characteristics.

NOTE — The requirements for safety have been covered in IS 302 (Part 2/Sec 6).

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

IS No.	*Title*
IS 302 (Part 2/Sec 6) : 2009	Safety of household and similar electrical appliances: Part 2 Particular requirements, Section 6 Cooking ranges, hobs, ovens and similar appliances
IS 3043 : 2018	Code of practice for earthing (*second revision*)
IEC 62301 : 2011	Household electrical appliances — Measurement of standby power

3 TERMINOLOGY

For the purposes of this standard, the following terms and definitions shall apply.

3.1 Cooking Range

Appliance having a hob and at least one oven and which may incorporate a grill.

NOTE — Methods for measuring performances of ovens shall be covered in different standard (*under consideration*).

3.2 Hob

Appliance or part of an appliance which incorporates one or more cooking zones and/or cooking areas including a control unit.

NOTES

1 A hob is also known as a cooktop.

2 The control unit can be included in the hob itself or integrated in a cooking range.

3.3 Cooking Zone

Limitative marking on the surface of a hob where one cookware is placed and heated or an attached area to the surface.

Example:

A cooking zone can be:

a) Single zone or a multiple zone (*see* **3.4** and **3.5**);
b) Solid hotplate (*see* **3.6**);
c) Tubular hotplate (*see* **3.7**);
d) Radiant cooking zone (*see* **3.8**); and
e) Induction cooking zone (*see* **3.9**).

NOTES

1 Cooking zones which are used without cookware but by positioning the food directly on the surface are not included.

2 Sometimes there is a decoration symbol, for example. a cross, to mark the centre of the cooking zone additionally.

3.4 Single Zone

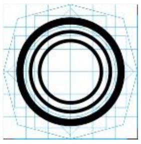
Cooking zone marked for one cookware size.

3.5 Multiple Zone

Cooking zone marked for more than one cookware size and shape which can be circular, elliptical or a combination.

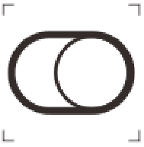
Example 1:

Circular multiple zone for three different cookware sizes:



Example 2:

Circular and elliptical multiple zone:



3.6 Solid Hotplate

Cooking zone having a closed surface, which is usually constructed from cast iron, with an integrated heating element.

3.7 Tubular Hotplate

Cooking zone having a surface which is formed by the configuration of a tubular heated heating element in a substantially flat plane.

3.8 Radiant Cooking Zone

Cooking zone on which the pan is heated by means of a radiant heating element below the glass ceramic which could have a heating ribbon, heating spiral or a tungsten wire which is located in a quartz glass bulb or combination of these.

3.9 Induction Cooking Zone

Cooking zone on which the pan is heated by means of an induction element below the glass ceramic or similar where the eddy currents are inducted in the bottom of the pan by a magnetic field.

3.10 Cooking Area Without Limitative Markings

Area where cookware is placed and heated by an inducted magnetic field without limitative markings.

Example:

see Fig. A-1.

NOTES

1 Cooking areas which are used without cookware but by positioning the food directly on the surface are not included.

2 Sometimes there are one or more decoration symbols, for example a cross, on the cooking area to mark the centre position where the cookware is placed.

3.11 Cooking Area with Limitative Markings

Area where cookware is placed and heated by an inducted magnetic field where the area is marked to show the limits where more than one cookware can be used simultaneously while the cookware pieces can be used and controlled separately from each other at the same time

Example:

see Fig. A-2

NOTES

1 Cooking areas which are used without cookware but by positioning the food directly on the surface are not included.

2 The cooking area is also used combined for one cookware even if there is more than one control.

3.12 Control

Part of the hob for adjusting the power or temperature respectively of a cooking zone or a cooking area for one piece of cookware, independent from technical solution, for example, knobs, touch controls, etc.

NOTES

1 The power is generally indicated as numbers, but also temperature values and symbols are possible.

2 Controls integrated outside of the hob in a separate device or as part of a built-in-oven are also included.

3.13 Warming Zone

Area used for keeping food warm usually not used for cooking.

NOTE — Normally one power setting exists that is ON and OFF.

3.14 Maximum Power

Maximum possible power setting while only one cookware is used.

NOTE — Boost function is considered.

3.15 Standardized Cookware

Cookware that is in accordance with the requirements given in **8.6.1**.

3.16 Alternative Cookware

Commercially available cookware that is in accordance with the requirements given in **8.6.2**.

3.17 Set to Off Mode

Action where the product is switched off using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a main power source and used in accordance with the manufacturer's instructions

NOTES

1 All actions required to set to off mode like, remove the cookware, etc are considered.

2 For definition of OFF mode IEC 62301 is relevant.

3.18 Set to Standby Mode

Action where the product is switched to standby using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a main power source and used in accordance with the manufacturer's instructions.

NOTE — For definition of standby mode IEC 62301 is relevant.

3.19 Thermal Efficiency (for Induction Hobs Only)

Thermal efficiency refers to the ratio of the heat received in a heating unit of an induction hob to the energy input to a heating unit of an induction hob.

4 CLASSIFICATION

Clause **6** of IS 302 (Part 2/Sec 6) shall apply.

5 MARKING

5.1 The electric hobs shall be indelibly marked with the information as given in Clause **7** of IS 302 (Part 2/Sec 6).

5.2 BIS Certification Marking

Electric hobs may also be marked with the Standard Mark. The use of the standard mark is governed by the provisions of *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the standard mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 SAFETY REQUIREMENTS

The electric hobs shall comply with the requirements given in IS 302 (Part 2/Sec 6), before they are subjected to test given in this standard.

7 LIST OF TESTS

7.1 Dimensions and Mass

a) Overall dimensions (*see* **9.1**);
b) Mass of the appliance (*see* **9.2**).
c) Cooking zones per hob (*see* **9.3**);
d) Level of solid hotplates (*see* **9.4**); and
e) Distance between the cooking zones (*see* **9.5**).

7.2 Cooking Zones and Cooking Areas

a) Energy consumption and Heating time (*see* **10** and Annex A);
b) Ability to control the temperature of a load (*see* **11**);
c) Heat distribution (*see* **12**);
d) Heat performance of hobs (*see* **13**); and
e) Smallest detected diameter for induction cooking zones (*see* **14**).

7.3 Cleaning

Spillage capacity for hobs (*see* **16**).

8 GENERAL CONDITIONS FOR THE TESTS

8.1 Test Room

The tests are carried out in a substantially draught-free room in which the laboratory ambient temperature is maintained at (27 ± 5) °C.

Only for the measurements described in **10** shall an ambient temperature of (23 ± 2) °C be maintained throughout the entire test.

This ambient temperature is measured at a point that is at the same height as the hob positioned at working height and at a distance of 0.5 m diagonally from one of the front edges of the appliance.

NOTE — The working height is normally between 800 mm and 1 000 mm.

The measurement of the ambient temperature shall not be influenced by the appliance itself or by any other appliance.

The absolute air pressure shall be between 913 hPa and 1 063 hPa.

8.2 Electricity Supply

The appliance is supplied at rated voltage with a relative tolerance of ±1 percent.

If the appliance has a rated voltage range, the tests are carried out at the nominal voltage of the country where the appliance is intended to be used.

For the test described in **10**, the supply voltage shall be maintained at the nominal voltage with a relative tolerance of ±1 percent as defined by the manufacturer's installation guide, while the heating elements are switched on.

The supply voltage shall be essentially sinusoidal.

NOTE — In case of a fixed cable, the plug (or the end of the cable) is the reference point to maintain the voltage.

The supply frequency shall be at the rated frequency ±1 percent throughout the test. If a frequency range is indicated, then the test frequency shall be 50 Hz .

8.3 Instrumentation and Measurements

Instruments used and measurements made for this document shall comply with the specifications in Table 1 and Table 2.

Table 1 Instruments
(*Clause* 8.3)

Sl. No. (1)	Parameter (2)	Unit (3)	Minimum Resolution (4)	Minimum Accuracy (5)	Additional Requirements (6)
i.	Mass (Clause **10**)	g	0.5 g	≤ (1 000 ±1) g > (1 000 ± 3) g	
ii.	Temperature				
	a) ambient temperature	°C	0.1 °C	± 1 °C	
	b) temperature of the water load (Clause **10**)	°C	0.1 °C	± 0.5 °C	3 mm steel tube
	c) temperature of the oil (Clause **11**)	°C	0.1 °C	± 0.5 °C	
iii.	Time	s	1 s	± 1 s	
iv.	Energy	Wh	-	± 1 percent	Very quick electronic on/off periods shall be taken into account by measurement techniques.
v.	Air pressure	hPa	1 hPa	± 1 percent	

Table 2 Measurements
(*Clause* 8 .3)

Sl. No. (1)	Parameter (2)	Unit (3)	Minimum Resolution (4)	Minimum Accuracy (5)	Additional Requirements (6)
i.	Voltage	V	-	± 0.5 percent	-
ii.	Temperature and energy consumption measurement (Clause **10**)		-	-	Sampling rate ≤ 1 s (digital measurement data)
iii.	For Clause **15**, the power measurement requirements shall be in accordance with IEC 62301		-	-	According to IEC 62301

The required accuracy of temperature measurement in the water load specified in **10** can be fulfilled by calibrating the temperature measurement or, for instance, by a PT100 sensor.

8.4 Positioning the Appliance

The hob or the cooking range is installed in accordance with the instructions for its installation. If no instructions for its installation are given, a cooking range is positioned between kitchen cabinets with its back to the wall and table top hobs are positioned away from sidewalls.

8.5 Initial Conditions

The appliance shall be at the laboratory's ambient temperature at the beginning of each test. Forced cooling may be used to assist in reducing the temperature.

All tests are carried out with the default factory settings. Ensure that no network is connected to the appliance for the duration of the measurement.

8.6 Cookware

8.6.1 *Standardized Cookware*

8.6.1.1 *General*

Cookware is an integral part of the cooking process; it affects different process parameters such as the adaptation of a cooking zone, the required settings and the needed cooking time.
A sufficient degree of reproducibility is only guaranteed if a piece of standardized cookware and lid is used as described in **8.6.1**.

Hobs working exclusively with a piece of supplied cookware and not with household-like cookware shall be tested with its supplied cookware, but it shall be covered with a lid in accordance with Table 3.

NOTE — Suppliers for the stainless steel and for the cookware for testing purposes are indicated in Clauses **F-3** and **F-4**.

8.6.1.2 *Standardized cookware — bottom material and construction*

a) Material: stainless steel AISI type 430, non-shiny surface;
b) Thickness: (6 ± 0.2) mm (*see* Fig. 1);
c) Dimensions as specified in Table 3;
d) Flatness of bottom plate as specified in Table 3;
e) A convex shaped bottom plate is not allowed. The flatness of the base has to be checked before starting a measurement; and
f) Annealing required.

For a sufficient permeability of the cookware bottom, the disc has to be annealed. The annealing should be done for approximately 2 h at approximately 650 °C in a nitriding-furnace.

Grinding for adjustment after alteration is allowed within the given tolerances of (6 ± 0.2) mm.

8.6.1.3 *Standardized cookware — sidewall*

a) Material: stainless steel AISI type 304;
b) Thickness: (1 ± 0.05) mm; and
c) Shape: cylindrical without handles or protrusions (*see* Fig.1).

The sidewall is fixed to the bottom plate with heat resistant glue.

The sidewall of the cookware can be built up of a metal sheet. The metal sheet is rolled and welded to a sheet-metal jacket. The sidewall can be fixed additionally by three welding points to the bottom, but the required bottom flatness has to be checked.

8.6.1.4 *Standardized cookware — lid with temperature sensor*

a) Material: aluminium;
b) Thickness: (2 ± 0.05) mm;
c) Dimensions as specified in Table 3; and
d) With holes, where each hole on the circle of the lid has diameter of (16 ± 0.1) mm; the holes shall be evenly distributed on the circle (*see* Fig. 1).

NOTE — The thermal energy which is needed to keep the water boiling for a real cooking process including evaporation and the energy absorption of the food during the simmering phase, is considered for the holes.

The flat lid is adapted to accommodate a temperature sensor in the centre. The temperature sensor is positioned (15 ± 1) mm above the inner cookware bottom. To achieve this, place a (15 ± 1) mm reference block on the bottom of the cookware. Mark the sensors and tighten the screws.

NOTE — An example how to fix the temperature sensor to the lid is listed in Annex B.

In order to reduce measurement noise generated by the electromagnetic field of an induction cooking zone or cooking area, the lid of the cookware shall be connected to ground through a clamp [*see* Fig. 1(d)]. The ground connection of the electric installation of the testing laboratory shall be according to IS 3043.

NOTE — An earthed wire of 2 mm^2 cross section and a maximum length of 2 m is welded to the metallic clamp.

8.6.1.5 *Standardized cookware – dimensions and water amounts*

The standardized cookware sizes and water amounts are defined in Table 3.

Table 3 Sizes of Standardized Cookware and Water Amounts

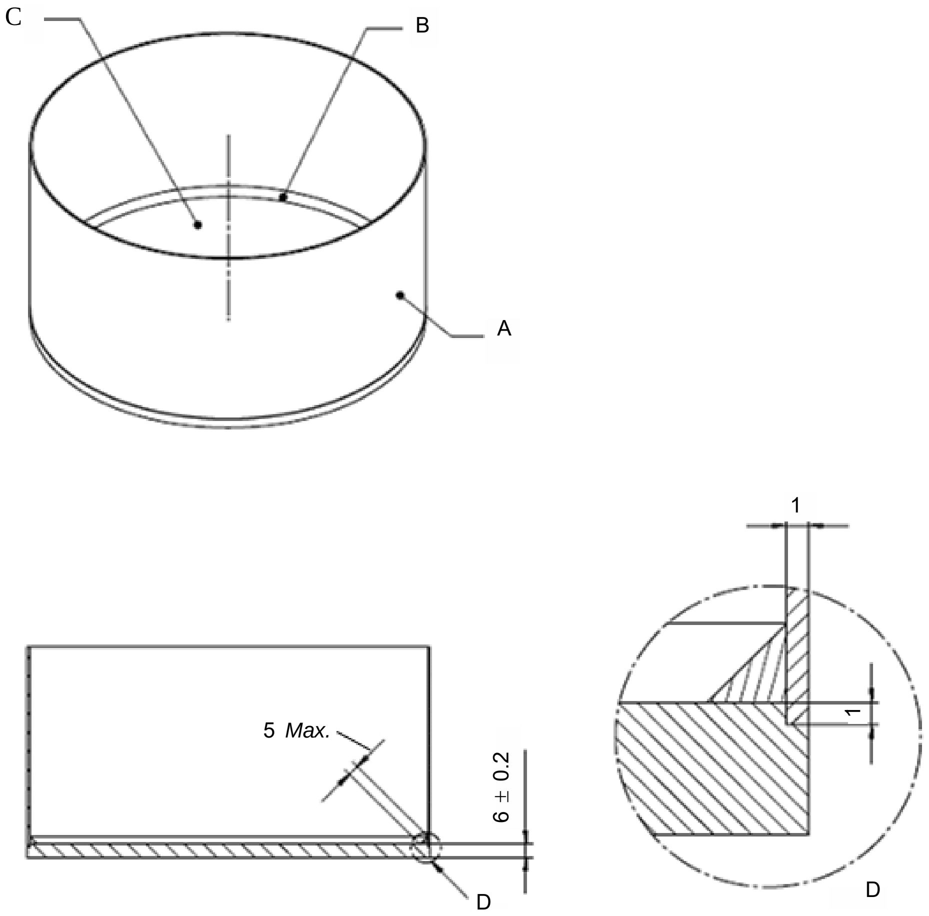
(*Clause* 8.6.1.5)

Sl. No. (1)	**Diameter of the Cookware Bottom (Outside)** mm (2)	**Diameter of the Lid** mm (3)	**Lid Hole Circle Diameter** mm (4)	**Number of Holes on the Circle** (5)	**Total Cook Ware Height (Outside)** mm (6)	**Flatness of Cook Ware Bottom** mm (7)	**Water Load** g (8)	**Cooking Zone Size Category** mm (9)	**Standardized Cookware Categories** (10)
i)	120 ± 0.5	130 ± 1	80 ± 1	7	125 ± 0.5	≥ 0 < 0.075	650	≥ 100 < 130	A
ii)	150 ± 0.5	165 ± 1	110 ± 1	11	125 ± 0.5	≥ 0 < 0.075	1030	≥ 130 < 160	
iii)	180 ± 0.5	200 ± 1	140 ± 1	16	125 ± 0.5	≥ 0 < 0.075	1500	≥ 160 < 190	B
iv)	210 ± 0.5	230 ± 1	170 ± 1	22	125 ± 0.5	≥ 0 < 0.1	2050	≥ 190 < 220	C
v)	240 ± 0.5	265 ± 1	200 ± 1	29	125 ± 0.5	≥ 0 < 0.1	2700	≥ 220 < 250	
vi)	270 ± 0.5	300 ± 1	230/210 [a] ± 1	18/18 [a]	125 ± 0.5	≥ 0 < 0.15	3420	≥ 250 < 280	D
vii)	300 ± 0.5	330 ± 1	260/210 [a] ± 1	23/22 [a]	125 ± 0.5	≥ 0 < 0.15	4240	≥ 280 < 310	
viii)	330 ± 0.5	365 ± 1	290/270 [a] ± 1	27/27 [a]	125 ± 0.5	≥ 0 < 0.15	5140	≥ 310 ≤ 330	

[a] Number of holes are arranged on two hole circles.

NOTE — The standardized cookware categories in Table 3 are only relevant for the standardized cookware. Categories are necessary to make sure that different cookware sizes as relevant in a household are considered.

Dimensions in millimetres



Key

A side wall

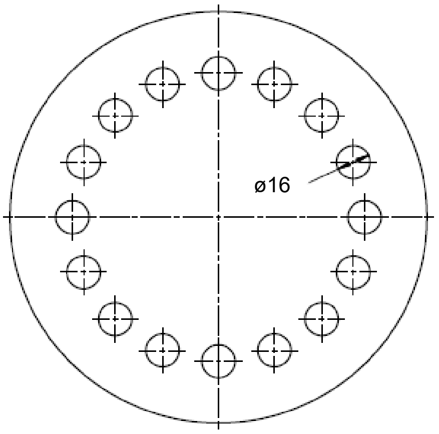
B heat-resistant glue

C bottom plate

D detail of the edge

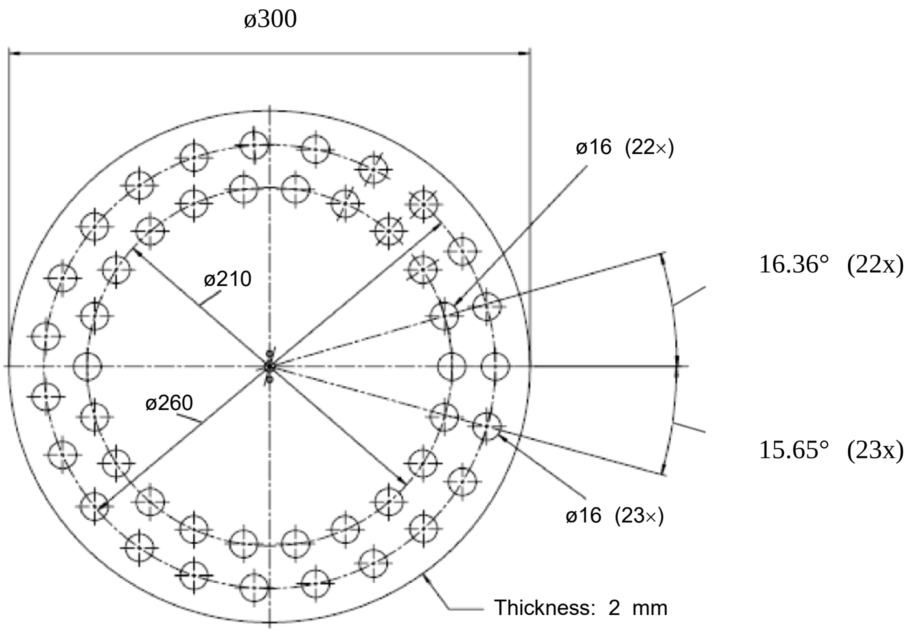
a) EXAMPLE FOR A COOKWARE SIZE OF 180 MM IN DIAMETER

Dimensions in millimetres



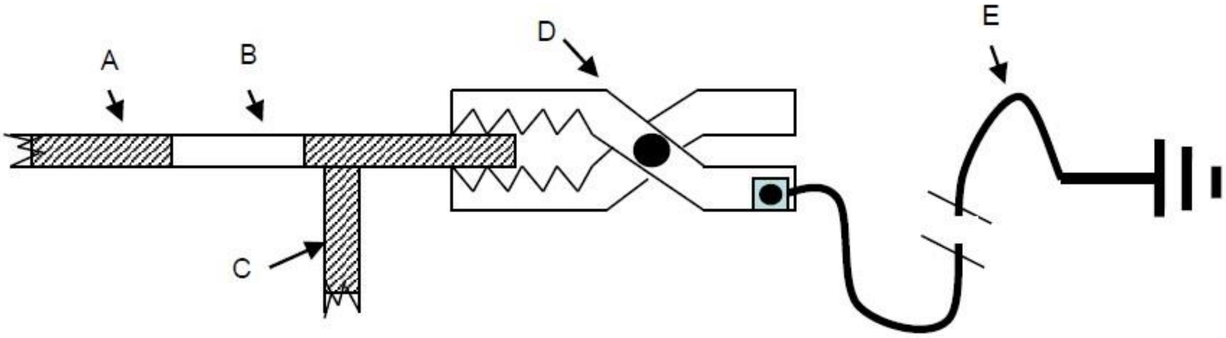
b) EXAMPLE – LID WITH A DIAMETER OF 180 MM

Dimensions in millimetres



NOTE — (22x) and (23x) shown in the figure above denotes number of holes provided on the inner and outer circle of the lid

c) EXAMPLE – LID WITH A DIAMETER OF 300 MM



Key

A lid
B hole
C cookware
D clamp
E ground wire

d) GROUND CONNECTION

FIG. 1 STANDARDIZED COOKWARE

8.6.2 *Alternative Cookware*

8.6.2.1 *General*

For comparative testing, alternative cookware may be used. The cookware used is noted. For comparative testing, for example on different sizes of cooking zones, always the same cookware samples shall be used.

8.6.2.2 *Alternative cookware — bottom material and construction*

a) Material: stainless steel bottom cladded with several layers, which typically clad a stainless steel layer, for example, AISI 430 or AISI 439 steel, an aluminium layer and a ferromagnetic layer (often also called ‘sandwich layer bottom’ or ‘aluminium clad’).
b) Flatness: < 0.003 *a*, where *a* is the outer diameter of the cookware's bottom.
c) A convex shaped bottom plate is not allowed. The flatness of the base hasto be checked before starting a measurement.
d) Thickness: ≥ 3 mm.
e) No aluminium or copper spots in the surface.
f) Without an aluminium ring outside.
g) No ferromagnetic coating or sputtering.
h) Without reliefs and stamps. Except one smaller stamp (ferromagnetic material) with a diameter less than 30 percent of the outer flat bottom diameter and a depth < 0.8 mm in the centre.
j) Uncoated.

8.6.2.3 *Alternative cookware — sidewall*

a) Material: non-ferromagnetic stainless steel, for example, AISI type 304.
b) Thickness: ≥ 0.8 mm.
c) Shape: cylindrical, angle between sidewall and hob surface 80° to 90°.
d) Uncoated.

8.6.2.4 *Alternative cookware — dimensions*

The size of cookware shall match the size of the cooking zone (*see* **9.3.2**) as well as possible. However, it may vary by a maximum of +20 mm and −10 mm.

For cooking areas, the sizes of the cookware under test are described in the test procedures.

For determining the size of the cookware, the outer diameter of the flat bottom of the cookware (*a*) is measured.

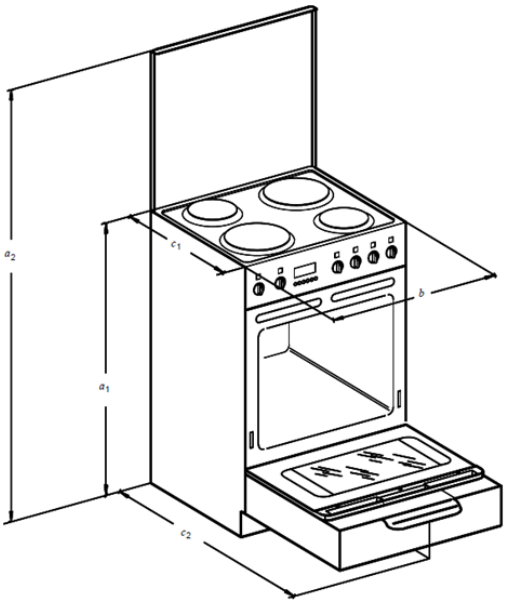
9 DIMENSIONS AND MASS

9.1 Overall Dimensions

The overall dimensions of the appliance are measured and stated in millimetres as follows:

a) cooking ranges and other appliances placed on a surface are measured as shown in Fig. 2; and
b) built-in hobs are measured as shown in Fig. 3.

The measured dimension shall be within ± 5 percent of the declared value by the manufacturer.



Key

a_1 height from the supporting surface to the hob surface

NOTE — If adjustable feet are provided; the height is measured with the feet in both extreme positions.

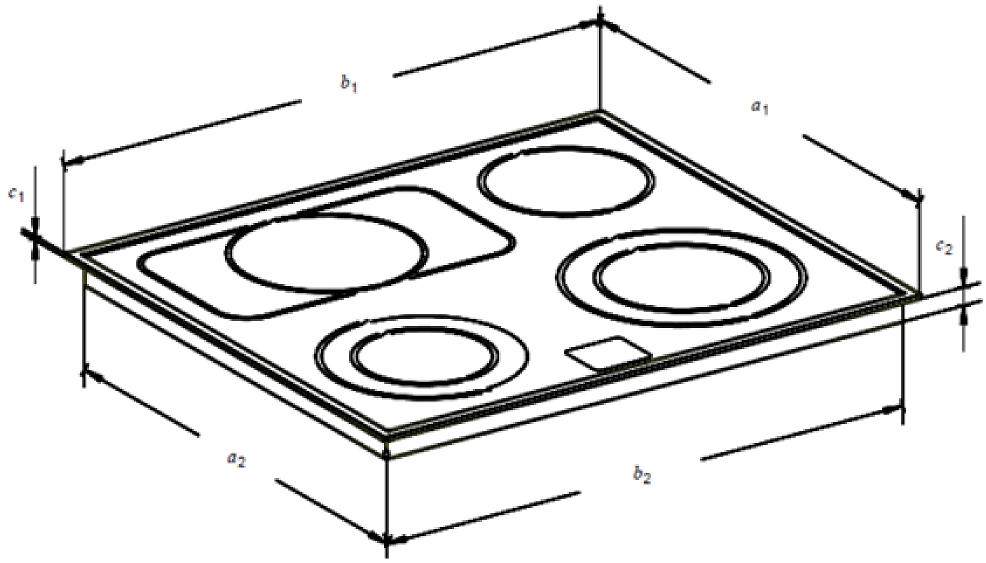
b overall width of the appliance

a_2 maximum height from the supporting surface to the uppermost part of the appliance, with any lid in the open position

c_1 depth of the appliance, ignoring any knobs, etc.

c_2 maximum depth of the appliance, with any doors and drawers fully open

FIG. 2 DIMENSIONS OF APPLIANCES



Key

a_1 depth of the hob

b_1 width of the hob

c_1 height of the hob on the outside of the kitchen furniture

c_2 height of the hob on the inside of the kitchen furniture

a_2 depth of the hob on the inside of the kitchen furniture

b_2 width of the hob on the inside of the kitchen furniture

FIG. 3 DIMENSIONS OF BUILT-IN HOBS

9.2 Mass of the Appliance

The mass of the appliance is determined and expressed in kg, rounded off to the nearest kg. The mass of the appliance shall be within ± 5 percent of the declared value by the manufacturer.

9.3 Cooking Zones and Cooking Areas

9.3.1 *Number of Cooking Zones per Hob*

The number of cooking zones is determined by the maximum number of controls that can be operated independently all at the same time.

9.3.2 *Dimensions of Cooking Zones*

The dimension of a cooking zone is determined by measuring the marked area on the surface. For a circular cooking zone, the outside diameter of the largest marked circle is measured. For a multiple zone, the dimension for each size is measured. For a solid hotplate, the diameter of the surface intended to come into direct contact with the bottom of the saucepan is measured. For a tubular hotplate, the diameter of the largest periphery excluding any leading section is measured. If the cooking zone is not circular, the dimensions are determined as follows:

a) for rectangular and similar shapes, the lengths of the sides are measured; and

b) for elliptical and similar shapes, the major and minor dimensions are measured.

The dimension of a radiant or induction cooking zone is determined by the printing on the surface independently of the size of the heating element. The dimensions are indicated in mm. The measured dimensions shall be within ± 5 percent of the declared values by the manufacturer.

9.3.3 *Dimensions of Cooking Areas*

For a cooking area that is marked to show the limits where more than one item of cookware can be used simultaneously, the maximum length and maximum width of the marked surface is noted. The measured dimensions shall be within ± 5 percent of the declared values by the manufacturer.

9.4 Level of Solid Hotplates

Cooking ranges with adjustable feet and hobs are installed with the perimeter of the hob surface horizontal.

A device consisting of a disc and an annular ring is placed centrally on the solid hotplate. A spirit level is placed centrally on the ring, as shown in Fig. 4.

Dimensions in millimetres

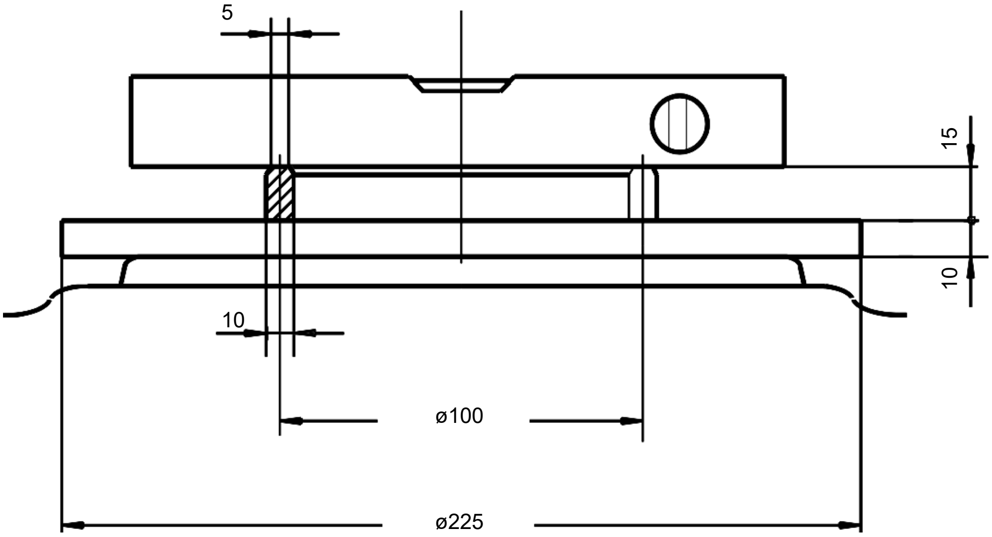


FIG. 4 DEVICE FOR CHECKING THE LEVEL OF SOLID HOTPLATES

A mass of 3 kg is placed on each of the remaining solid hotplates. The spirit level is rotated to the position where it shows the maximum inclination from the horizontal. Its lower side is then lifted to the horizontal by inserting a feeler gauge between the level and the ring. The measurement is carried out on each solid hotplate. The deviation from the horizontal is given by the thickness of the gauge, in mm, to two decimal places. It is expressed as a percentage, rounded to the nearest 0.1 percent.

NOTE — The direct conversion from mm to percentage is possible due to the ring having a diameter of 100 mm.

The measured dimensions shall be within ± 5 percent of the declared value by the manufacturer.

9.5 Distance Between Cooking Zones

The shortest distance between the edges of adjacent cooking zones is measured and indicated in mm, rounded to the nearest mm. If the hob has more than two cooking zones, the distance between each pair is determined. The result may be shown by means of a sketch. The measured dimensions shall be within ± 5 percent of the declared value by the manufacturer.

10 ENERGY CONSUMPTION AND HEATING UP TIME

10.1 General

To guarantee reproducible results, the tests in Clause **10** shall be carried out with standardized cookware. The tests described in **10** are applicable to cooking zones with a diameter ≤ 330 mm and ≥ 100 mm or where one of the sides' lengths is ≤ 330 mm and ≥ 100 mm.

In addition, tests are applicable to cooking areas. Further requirements concerning cooking areas are described in Annex A. For multiple zones that include a circular and an elliptical or rectangular part, only the circular part is tested.

10.2 Purpose

In the first place, the purpose is to determine the energy consumption for heating up a defined water load and keep it at a defined temperature level for 20 min.

In a second measurement, the heating up time of a defined water load can be determined.

NOTES

1 Heating up and keeping the temperature for a defined period represents a typical household cooking process. Additionally, the quality of the control is measured by keeping an amount of water at a defined temperature as exactly as possible.

2 The simmering time of 20 min represents an average household cooking duration. Additionally, at least 20 min further simmering time is necessary to assess the quality of a control that influences the energy consumption.

10.3 Determine a Cookware Set to Assess a Hob with Cooking Zones

The number of pieces of cookware needed to assess a hob shall correspond to the number of controls which can be used simultaneously and independently. The sizes and number of cookware pieces are selected according to Table 4.

Table 4 Criteria for Selecting the Cookware Set Regarding Cooking Zones

(*Clause* 10.3)

Sl No. (1)	Number of Cookware used for Tests According to Clause 10 (2)	Criteria for Selecting a Cookware Set Regarding Cooking Zones (3)
i)	1	From one standardized cookware category according to Table 3 that is equal to the dimensions of the cooking zone or best fit.
ii)	2	At least from one standardized cookware category according to Table 3 that are equal to the dimensions of the cooking zones or best fit.
iii)	3	At least from two standardized cookware categories according to Table 3 that are equal to the dimensions of the cooking zones or next best fit cookware category.
iv)	4 or more	At least from three standardized cookware categories according to Table 3 that are equal to the dimensions of the cooking zones or next best fit cookware category.

For circular multiple zones, the biggest diameter determined according to **9.3.2** is considered. For non-circular cooking zones**,** the cookware size is determined by the short axis measured according to **9.3.2**.

If on an induction hob cookware is not detected, the next biggest cookware diameter is chosen independent from the cookware category.

If a standardized cookware category A-D has to be substituted, the next best-fitting cookware is selected. The cookware with the closest bottom diameter compared to the cooking zone diameter is chosen. As a result, cookware can be smaller or bigger than the cooking zone. Therefore, also smaller diameters of multiple zones can be considered. Each cooking zone is taken into account only once. The one with the closest diameter to the cooking zone is the best fitting cookware size.

If a selected cookware size is out of the range of the sizes allowed by the user manual,then the closest diameter compatible with the defined range shall be chosen. If it is not clear which cookware size is best fitting, all possibilities are considered inthe measurement.

NOTE — As mentioned in **10.1**, for multiple zones which include a circular and an elliptical or rectangular part, only the circular part is tested.

10.4 Positioning the Cookware on a Cooking Zone

On a cooking zone, the cookware is used in the centre. The centre of an elliptical or similar shaped cooking zone is determined in the intersection of the shortest and longest axis. The centre of a rectangular or similar cooking zone is determined in the intersection of the two diagonals.

If two cooking zones with the same size are available and cookware pieces with different sizes have to be placed there, then the position for the bigger cookware size will be made in accordance with the following order of precedence:

a) cooking zones having highest maximum power;
b) cooking zones being located at the rear of the hob; and
c) cooking zones being located on the left.

10.5 Procedure for Measuring the Energy Consumption of a Cooking Process

10.5.1 *Preparation*

Before the first measurement is taken, all cooking zones have to be operated for at least 10 min at maximum setting. This is only necessary once to make sure that residual water in the components is vaporized. Afterwards, the hob has to be cooled down to approximately ambient temperature before starting measuring the energy consumption.

For measuring the energy consumption, only one control and one cookware shall be used. The appliance and the standardized cookware shall be at ambient temperature.

The empty standardized cookware is filled with the quantity of potable water specified in Table 3. To avoid lime sediment, distilled water may be used.

The water is stirred to ensure a uniform temperature and the temperature of the water is measured when the average temperature of cookware and water has stabilized. The initial temperature shall be in the range of (15 ± 0.5) °C (T_{15}). The filled cookware should not be stored in the fridge to avoid the rims getting too cold.

The standardized cookware covered with the lid is positioned centrally on the cooking zone or according to **A-3** on the cooking area, the control is set to maximum power and the measurement shall be started immediately.

NOTE — Water having an initial temperature of 14.5 °C minimizes the stirring time.

If the smaller diameter of multiple zones is considered, the corresponding power is used.

10.5.2 *Preliminary Measurements*

10.5.2.1 *Determine* T_c

A preliminary test is carried out to determine the appropriate water temperature for reducing the power setting (T_C). The procedure described in **10.5.1** shall be followed. The power shall be switched off when the water temperature reaches 70 °C (T_{70}).

The temperature rising is recorded continuously (*see* Table 2). The difference between the highest temperature value and T_{70} is stated as temperature overshoot (ΔT_O) in °C , *see* Fig. 5.

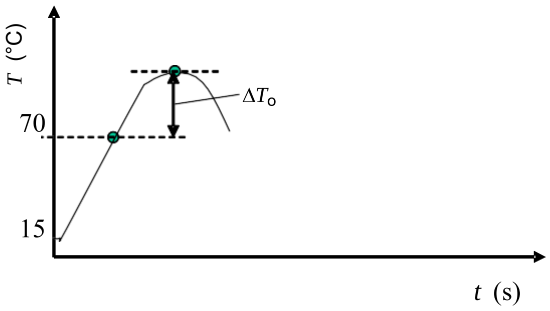


FIG. 5 OVERSHOOT MEASUREMENT

NOTE — For ΔT_o the value stated on the temperature measuring instrument is taken.

A valid temperature T_{70} is determined by the average of the recorded temperature between t_{70} – 10 s and t_{70} + 10 s. If the result is within the tolerance of (70 ± 0.5) °C, then this temperature is noted. If not, the test is repeated by adjusting the switch-off temperature.

T_C, the temperature for reducing the power setting, is calculated according to the following Formula (1):

$$T_C = 93\ °C - \Delta T_O \qquad (1)$$

where T_C is rounded to the nearest integer.

In the event that the temperature limiter of a radiant cooking zone switches down the power during the t_C period, that is, the time when the setting is reduced, a 2 K higher T_C is allowed.

If the calculated T_C is ≤ 80 °C, then 80 °C is taken as T_C.

T_C is stated.

NOTE — Empirical tests show that induction cooking zones/cooking areas, radiant cooking zones and solid plates have each a similar T_C. The following values are representative and they can substitute the result of **10.5.2.1** as fixed values:

a) Induction cooking zones and cooking areas T_C = 89 °C;

b) Radiant cooking zones T_C = 85 °C; and

c) Solid plates T_C = 80 °C.

10.5.2.2 *Determine the simmering setting*

A second preliminary test is carried out to determine the lowest level to set to achieve ≥ 90 °C during the remaining cooking period. The procedure stated in **10.5.1** is followed.

If T_c is reached, the setting is reduced to achieve the water simmering at a temperature ≥ 90 °C and as close as possible to 90 °C. A further change of setting is not allowed. For T_c, the tolerances are + 1.0 °C /− 0.5 °C .

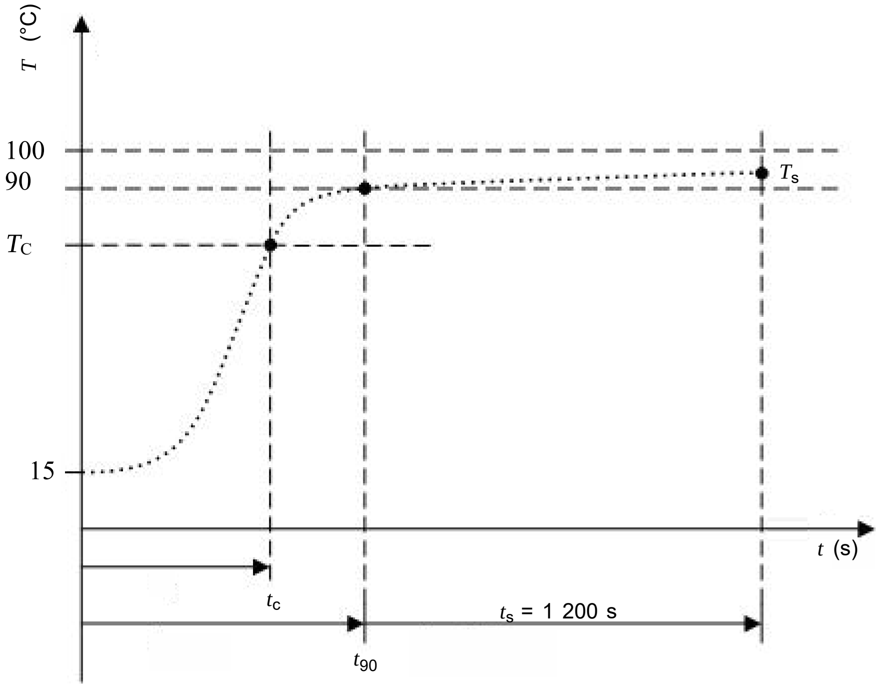
At first, the lowest simmering setting is selected. If the temperature of the water is < 90 °C during the simmering time, the energy consumption measurement has to be repeated with an increased setting, provided that the temperature of the water is < 90 °C after the measured data T are evaluated according to **10.5.4.1.**

When the water temperature reaches 90 °C for the first time (T_{90}), the simmering time starts independently of T_C. The simmering time is 20 min. The lowest possible simmering setting is noted. For control units without detent, the knob position should be marked. The simmering setting could differ if a knob is turned from a higher position to a lower position compared to turning from a lower position to a higher position.

NOTE — For a clear marking of the lowest possible simmering setting, a polar coordinate paper can be useful (*see* Annex B).

10.5.3 *Measuring the Energy Consumption*

The procedure stated in **10.5.1** is followed. The results from **10.5.2.1** and **10.5.2.2,** illustrated in Fig. 6, are applied. After finishing, the appliance is set to off mode. If the appliance doesn’t offer an off mode, it is set to standby mode.



where

t_{90} is the time when the temperature of 90 °C is reached and the simmering period starts, in s;

t_C is the time when the setting is reduced, in s;

t_S is the simmering time, in s;

T_C is the water temperature when the setting is reduced, in °C;

T_S is the water temperature at the end of the process, in °C.

FIG. 6 ENERGY CONSUMPTION MEASUREMENT PROCESS FOR A COOKING PROCESS

The following data shall be recorded:

a) Continuously, the energy consumption starting at t_0 and ending at t_S + 1 min, inWh;
b) t_C and t_{90} , in min and s;
c) initial temperature of water, T_C, and the temperature T_S of the water in °C;
d) average power during the simmering time t_S, in W;
e) ambient temperature in °C at the start of the test (when the hob is switched on) and at the end of the test (after 20 min of simmering time);
f) relative air pressure at the start of the test and at the end of the test, in hPa.

The test is performed three times if the hob is tested only with one or two cookware pieces.

NOTE — The energy consumption of components such as fans and displays, which are automatically switched on with the appliance, are included in the measurement.

10.5.4 *Evaluation and Calculation*

10.5.4.1 *Evaluation*

Temperature measurement noise can be caused by the convection of water and by measurement noise of the measurement setup itself. As a consequence, minor oscillations of the measured temperature occur. In order to determine the actual crossing of 90 °C, excluding possible measurement noise, the measured data T is smoothened with a time interval of t_{mov} = 40 s.

First, the measured data T are considered using an averaging algorithm, *see* Formula (2), giving the new data $\overline{T}$.

$$\overline{Ti} = \frac{1}{2n+1} \cdot \sum_{j=-n}^{n} Ti + j \qquad (2)$$

Where

$\overline{T}_i$ is the smoothened temperature data;

i is the sample index;

n is defined $n = \left\lfloor \frac{t_{mov} \times f_s - 1}{2} \right\rfloor$ by and where t_{mov} = 40 s;

f_S is the sampling rate in $\frac{1}{s}$

NOTE — n is rounded.

Secondly, $\overline{T}_C$ is checked and shall be within the tolerance of +1.0 °C /− 0.5 °C .

Thirdly, the time t_{90} is determined according to $\overline{T}\ (t_{90}) = 90\ °C$

Fourthly, the data $\overline{T}$ are controlled, $\overline{T} > 90$ °C from t_{90} to t_{s}. $\overline{T}_S$, the smoothened final water temperature, is stated.

Finally, the energy consumption during the time $t_{90} + t_S$ is determined and stated in Wh.

10.5.4.2 *Calculation of the result for a hob*

To calculate the result for a hob, the calculated energy consumption according to **10.5.4.1** is used. The energy consumption per cooking zone is equal to E_{CW} and shall be noted with the cookware size under the test normalized to 1 000 g.

The energy consumption per cooking area is the arithmetic mean of the energy consumption values of the pieces of cookware considered according to Table A-1 and Table A-2 on this type of cooking area normalized to 1 000 g.

The single results according to **10.5.3** and Annex A are determined for a hob as follows. The energy consumption E_{hob} is calculated as follows:

a) The result of each cookware is normalised to 1 000 g of water; the energy consumption is divided by the quantity of water used for the cookware under test.

b) The average of the normalised energy consumption of the hob is calculated considering all cookware pieces under test, *see* formula (3).

$$E_{hob} = \frac{1\,000\,g}{n_{cw}} \times \sum_{cw=1}^{n_{cw}} (E_{cw} / m_{cw}) \qquad (3)$$

where

E_{hob} is the energy consumption of a hob calculated per 1 000 g water in Wh;

E_{CW} is the energy consumption with a single cookware under test in Wh;

m_{CW} is the quantity of water used for the test of the respective cookware piece in g; and

n_{CW} is the number of cookware pieces on the hob.

For an example data and calculation sheet, *see* Annex E. The energy consumption of the hobs shall not exceed 200 Wh.

10.6 Procedure for Measuring the Heating Up Time

Before the first measurement is taken, all cooking zones have to be operated for at least 10 min. This is only necessary once to make sure that residual water in the components is vaporized. Afterwards, the hob has to be cooled down to approximately ambient temperature before starting measuring the heating up time.

For measuring the heating up time, only one control and one cookware shall be used.

The standardized cookware is filled with the quantity of potable water specified in Table 3. The water has a temperature of (15 ± 0.5) °C. The standardized cookware covered with the lid is positioned centrally on the cooking zone or according to **A-3** on the cooking area. The cooking zone or cooking area is heated with maximum power**.**

NOTE — If the smaller diameter of multiple zones is considered, the corresponding power is used.

The time taken for the water temperature to rise by 75 °C is measured. The test is performed three times and the average value of the results is determined.The time is stated in min and s, rounded to 10 s. The measured heating up time of the hob shall be within ± 5 percent of the declared value by the manufacturer.

10.7 Thermal Efficiency

Thermal efficiency shall be calculated for heating period only, when subjected to test in accordance with Clause **10**. The thermal efficiency calculation is based on the time taken for the water temperature to rise by 75 K and excludes the simmering time period.

Thermal efficiency shall be calculated using the following equation.

$$\text{Thermal Efficiency, } \eta = \{(c_1 \times m_1 + c_2 \times m_2) \times \Delta T / (3.6 \text{ x } 10^3 \text{x } E)\} * 100 \text{ percent}$$

Where

η is Thermal efficiency (%) of the Induction Hob

c_1 is Specific heat of water, 4.18 kJ/kg°C

m_1 is Mass of water (kg)

c_2 is Specific heat of Cookware bottom material, Stainless Steel AISI Type 430, 0.450 kJ/kg°C

m_2 is Total mass of Cookware body and lid (kg)

E is Electricity consumption (kWh) for heating for temperature rise of 75 K

$\triangle T$ is the temperature rise, $\triangle T = T_2 - T_1$ (°C)

The measured thermal efficiency shall be not less than 80 percent.

11 ABILITY TO CONTROL THE TEMPERATURE OF A LOAD

11.1 Lower Control Position

11.1.1 *Purpose*

The purpose of this test is to check the function of a control for a lower setting, like melting chocolate.

NOTE — For increasing the repeatability, oil is used instead of chocolate. In pre-tests it was proven that the behaviour of melting chocolate can be reflected by warming up a quantity of oil.

11.1.2 *Cookware, Positioning and Ingredients*

For reproducible results, the standardized cookware shall be used. For comparative testing, alternative cookware may be used. A piece of standardized cookware with a bottom of a diameter (outside) of (150 ± 0.5) mm is used. When selecting a piece of alternative cookware, the diameter of this cookware shall be 150^{+20}_{-10} mm.

If the hob has no cooking zone ≥ 130 mm and < 160 mm, the test is carried out with a piece of standardized cookware that has a bottom of a diameter (outside) of (180 ± 0.5) mm. For comparative testing, a piece of alternative cookware can be used with a diameter of 180^{+20}_{-10} mm. The cookware is used without a lid.

On cooking areas, the cookware is positioned in accordance with the manufacturer's instructions for positioning this diameter. If no instruction is given, it is positioned in accordance with the requirements for this cookware size stated for measuring the energy consumption (*see* Annex A). On a hob with cooking zones, the cookware is placed centrally on a fitting cooking zone.

The standardized cookware is filled with fresh sunflower oil at room temperature using the amounts stated in Table 5. For alternative cookware, the amount of oil has to be adapted accordingly, so that the filling height is approximately 30 mm.

NOTE — Sunflower oil is considered to be fresh if it has not been used more than three times.

Table 5 Amount of Oil

(*Clause* 11.1.2)

Sl. No. (1)	**Diameter of the Standardized Cookware Bottom (outside)** mm (2)	**Amount of Sunflower Oil** g (3)	**Cooking Zone Size Category** mm (4)
i.	150 ± 0.5	450 ± 5	≥ 130 and < 160
ii.	180 ± 0.5	650 ± 5	≥ 160 and < 190

11.1.3 *Procedure*

The cooking zone or cooking area is heated in accordance with the manufacturer's instructions for melting chocolate. If no instructions are given, the control is set at the lowest possible setting. The temperature at the centre of the oil is recorded continuously by means of a thermocouple in accordance with **8.3**, which is located 15 mm above the inner cookware bottom centrally. The oil is not stirred and is heated up:

a) If the temperature reaches (50 ± 0.5) °C in ≤ 30 min, the oil is further heated for 15 min with an unchanged setting. Then the control is set to off;
b) If (50 ± 0.5) °C is reached after > 30 min and ≤ 45 min, the oil is further heated with an unchanged setting until the test reaches a total duration of 45 min; and
c) If (50 ± 0.5) °C is not reached within 45 min, the control is set to off after 45 min.

In any case, the total test duration of 45 min shall not be exceeded.

11.1.4 *Assessment*

The recorded temperature during the heating phase is analyzed.

Certain temperature requirements that are same for both cookware sizes have to be fulfilled so that the lower setting of the control is adequate for melting processes. These requirements take into account the following steps:

a) an increase in temperature not too high at the beginning in order, for example, not to burn the chocolate before it is melted;
b) a sufficient temperature after a certain time, adequate, for example, for melting the chocolate in an appropriate time; and
c) a limited temperature after a certain time, which, for example, keeps the chocolate melted for a certain time.

An example for the analysis of the temperature curve is given in Annex G that is based on the standardized cookware, which allows an exact assessment.

11.2 Temperature Overshoot of Hotplates

11.2.1 *Purpose*

The purpose of this test is to assess the heat retention of the hotplate.

NOTE — This test is applicable for comparative testing only.

11.2.2 *Ingredients and Cookware*

For reproducible results, the standardized cookware shall be used. For comparative testing, alternative cookware may be used. The cookware is used without a lid.
The cookware is selected and filled with fresh sunflower oil at room temperature following the requirements in **11.1.2** and it is placed on the hotplate.

11.2.3 *Procedure*

The hotplate is heated with the control set at the maximum position. The temperature at the centre of the oil is recorded continuously by means of a thermocouple. The oil is not stirred. When the oil temperature reaches (80 ± 0.5) °C, the supply is switched off. The temperature in the oil is recorded continuously until the temperature starts declining.

11.2.4 *Assessment*

The temperature overshoot is the difference between the highest recorded temperature and the temperature of the oil and the temperature of 80 °C. The temperature increase from 80 °C to the highest measured temperature is stated in °C. The measured value of the temperature overshoot shall be within ± 5 percent of the declared value by the manufacturer.

12 HEAT DISTRIBUTION AND HEAT SUPPLY

12.1 Measuring the Heat Distribution

12.1.1 *Test Purpose*

The purpose of this test is to measure the heat distribution of cooking zones and cooking areas. Therefore, a steel disc is spread with a thin layer of fat and flour, positioned on the cooking zone or cooking area and heated up. The browned surface of the disc after a certain time is representative for the heat distribution of a cooking zone or cooking area.

The test is applicable to cooking zones with a diameter ≤ 330 mm and ≥ 100 mm or where one of the sides' lengths is ≤ 330 mm and ≥ 100 mm.

For multiple zones that include a circular and an elliptical or rectangular part, only the circular part is tested.

12.1.2 *Discs*

The material of the disc is stainless steel AISI type 430 of thickness (6 ± 0.2) mm. To guarantee a sufficient permeability of the cookware bottom, the disc has to be annealed.

NOTE — The annealing is done for approximately 2 h at approximately 650 °C in a nitriding-furnace.

The flatness of the disc is specified in Table 6 for different sizes. Top and bottom surfaces of the discs shall be sand blasted in the following conditions:

a) Pressure of 300 kPa;
b) High-class corundum type 054; and
c) Particle size: 0.25 mm to 0.36 mm.

NOTES

1 This treatment is required to guarantee that enough flour is attached.

2 A possible supplier is indicated in Clause **F-5**.

The sandblasting process can be repeated if tenacious stains caused by fat and flouroccur which cannot be removed by cleaning or bleaching. The discs are specified in Table 6. To select the best-fitting disc, the cooking zone diameter is determined in accordance with **9.3** and the determined diameter is assigned to the adequate cooking zone size category in accordance with Table 6. The second column of Table 6 indicates the appropriate disc diameter. The third column specifies the allowed tolerances for the flatness. For circular, elliptical or rectangular multiple zones, always the biggest possible diameter according to **9.3** is tested. For cooking areas, the discs are selected and positioned according to Annex A.

If, on an induction hob, a disc is not detected, the next biggest disc diameter is chosen. If a selected disc size is out of the range of the cookware sizes allowed by the usermanual, then the closest diameter compatible with the defined range shall be chosen.

Table 6 Specifications for Discs Used for Measuring the Heat Distribution
(*Clause* 12.1.2)

Sl No. (1)	Cooking Zone Size Category mm (2)	Diameter of the Discs (Outside) mm (3)	Flatness of Discs mm (4)
i)	≥ 100 < 130	120 ± 0.5	≥ 0 < 0.2
ii)	≥ 130 < 160	150 ± 0.5	≥ 0 < 0.2
iii)	≥ 160 < 190	180 ± 0.5	≥ 0 < 0.2
iv)	≥ 190 < 220	210 ± 0.5	≥ 0 < 0.5
v)	≥ 220 < 250	240 ± 0.5	≥ 0 < 0.5
vi)	≥ 250 < 280	270 ± 0,5	≥ 0 < 0.5
vii)	≥ 280 < 310	300 ± 0.5	≥ 0 < 0.7
viii)	≥ 310 ≤ 330	330 ± 0.5	≥ 0 < 0.7

12.1.3 *Pre-test for Determining the Setting*

The heat distribution test shall be conducted with a power density q, where q is defined as the heat capacity per area unit of the disc in W/cm^2. The power density shall be 0.9 W/cm^2 $\leq q \leq$ 1.2 W/cm^2. For an adequate setting, a preliminary test is carried out by following these steps:

a) Place the disc (without greasing and flouring) selected according to Table 6 centrally on the cooking zone, for cooking areas, follow the selecting and positioning procedure described in Annex A;

b) Switch on the cooking zone or cooking area with a setting where the power density 0.9

W/cm^2 ≤ q ≤ 1.2 W/cm^2 is expected;

c) Measure the mean energy consumption (EC_m) of the cooking zone or cooking area within 10 min;

d) Switch off the cooking zone or cooking area and note the energy consumption EC_m in Wh; and

e) Calculate the mean power $\bar{P}$ with Formula (4):

$$\bar{P} = \frac{6\, EC_m}{1\, h} \qquad (4)$$

calculate the power density q with Formula (5):

$$q = \frac{\bar{P}}{a_d} \qquad (5)$$

where

$\bar{P}$ is the mean power in W;

EC_m is the energy consumption in Wh within 10 min;

q is the power density in W/cm^2; and

a_d is the surface area of the disc in cm^2.

If the determined power density q is not in range of 0.9 W/cm^2 ≤ q ≤ 1.2 W/cm^2, the pre-test is repeated with an adapted setting of the control. If no setting can be determined in the range of 0.9 W/cm^2 ≤ q ≤ 1.2 W/cm^2, the settingnext to the upper limit of the range is determined.

NOTE — If the determined power density is close to 0 .9 W/cm^2, within the main test the power density can drop below the limit for those technologies which show an unsteady power input.

12.1.4 *Preparation of the Disc for the Main Test*

12.1.4.1 *Ingredients*

The following ingredients are used for preparing the disc:

a) Flour: wheat flour without raising agent, unbleached, mineral content: maximum 0.5 percent (dry substance); and

b) Fat: coconut fat with a fat content of 100 percent.

12.1.4.2 *Procedure*

For the main test, the disc is greased and floured according to following procedure:

a) Temper the disc at 40^{+10}_{-5} °C for at least 20 min. A preheated oven may be used if the required temperature can be maintained;

b) Take the disc out of the oven and grease the upper surface with fat by using a cosmetic sponge. First spread the fat radially and afterwards vertically along the whole surface. The fat film shall be very thin;

c) Put the disc back into the oven with the greased surface facing up and warm at 40^{+10}_{-5} °C at least for a further 15 min, so the fat layer becomes very even;

d) Remove the disc again;

e) Fix a suction lifter on the lower surface of the disc for better handling;

f) Sieve the flour on the upper surface of the disc using a sieve with a mesh size between 300 µm and 800 µm (diameter);

g) Beat the edge of the floured disc twice onto a wooden board to remove the surplus flour;

NOTE — Care shall be taken to ensure that the edge of the floured disc doesn’t touch the flour knocked off before. If the disc dip into this pile of flour knocked off before the even layer can be affected.

h) Flour the disc again, rotate it by 90 °C and beat it on the wooden board twice. Repeat the flouring until the layer of flour is very even;

NOTE — Normally 4 times flouring is enough to reach a thin even layer of flour.

j) Check if the flour achieves a smooth, even and thin layer. Otherwise clean the disc and repeat the procedure; and

k) The suction lifter is removed.

12.1.5 *Main Test*

The cooking zone or cooking area shall be at ambient temperature. Place the evenly floured disc centred on the cooking zone. Switch on the cooking zone with the appropriate setting determined in **12.1.3**. For cooking areas place the disc according to Annex A.

Heat up the disc without any change of setting until the main part of the flour is browned up to NCS level 10 to 12 according to Annex D. The browning is checked visually by the shade charts according to Annex D.

When the required browning matching NCS 10 to 12 according to Annex D is reached, the cooking zone or cooking area is switched off and the disc is shifted from the hot cooking zone or cooking area immediately. Stop the test in advance if the first parts of the disc have match NCS 15 according to Annex D before the required average browning of NCS 10 – 12 according to Annex D is reached. The time t from switch on the control up to switch off is stated in seconds. The energy consumption during the time t is stated in Wh. The position of the disc used on the cooking area is stated.

12.1.6 *Assessment*

12.1.6.1 *General*

Start the assessment after the disc has cooled down to approximately ambient temperature, at the latest within 24 h. Take care not to damage the sensitive flour layer. In case the surface is damaged, the test has to be discarded.

For the assessment, only the part of the disc, which covers the cooking zone, is defined as the area to be assessed.

Example 1:

A cooking zone with a diameter of 130 mm is tested using a disc with a diameter of 150 mm (*see* Table 6), so the diameter of both differs by 20 mm. For the assessment, these 20 mm of the disc are not considered.

For cooking areas, not the entire area of the used disc is relevant but only the area of the used disc minus 15 mm of the outer radius. In this way, the impact of an active rim of a pan is considered, which can influence the activation of coils.

Example 2:

A disc with a diameter of 180 mm is positioned on a cooking area according Annex A. In a pre-test, the power density is calculated taking into account the area of 180 mm in diameter. For the assessment, only the inner 150 mm diameter is considered.

Alternatively, the floured disc can be evaluated visually, but for comparative testing only. By using the shade charts described in Annex D, the assessment can be made based on the criteria in **12.1.6.3** and **12.1.6.4**.

12.1.6.2 *Requirements to the digital measurement system*

For reproducible results of the evaluation of browning, any digital measurement system shall be used that meets the following requirements when the measurements are taken.

a) Evenness of light distribution on the measurement area

The reflection value R_y of a uniform coloured shade chart shall be measured over the entire surface to be analysed, for example, the size of the biggest disc. The shade chart shall be coloured in shade number 10, which is defined in Annex D.

The mean value of the reflection value R_y over the entire surface is determined. More than 90 percent of the entire surface may deviate from the mean value by up to ±5 percent. Less than 10 percent of the entire surface may deviate by up to ±8 percent.

The entire surface is divided into sections of 1 cm^2. None of the mean values of the 1 cm^2 sections shall deviate by more than ±5 percent of the mean value of the entire surface.

b) Recognition of the shade numbers

The shade numbers defined in Table D-1 shall be confirmed in all positions of the surface to be assessed. This is ensured using the following check: flat circular calibrated colour samples with a diameter of 70 mm in every shade number defined in Annex D are placed at a height of 28 mm. The reflection value R_y of the calibrated colour samples shall be measured in the outermost points of the area to be assessed, as well as in the centre.

The reflection value R_y of the calibrated colour samples shall be measured with the tolerances given in Table D-1.

The H values of the limiting samples H_{limit} and H_{lower} which are specified in Table D-2 are measured in the outermost points of the area to be assessed, as well as in the centre. Therefore, flat circular colour samples with a diameter of 70 mm in shade numbers 5 and 6 (defined in Annex D) are placed at a height of 28 mm. H_{limit} and H_{lower} shall be distinguishable from each other concerning their H values in all positions of the surface to be assessed.

NOTES

1 Squared colour samples with a length of 70 mm and width of 70 mm could be used as well.

2 Technical details are not fixed in order to be open for technical progress (for example, camera, software).

3 The hue value refers to the HSL colour model.

c) Definition of the illuminance

The measurement is taken under a full spectral fluorescent triband or equivalent from 5 700 K to 7 000 K, with a colour rendering index R_a > 90 percent of illumination.

NOTES

1 Suppliers for suitable lamps for testing purpose are indicated in Clause **F-6**.

2 Suppliers of colour measuring systems, which meet these requirements, are given in Clause **F-7**.

d) Minimum requirement to the resolution of the digital measurement system

To ensure a sufficient resolution use a test chart showing at least three pairs of black and white lines with a thickness of 1 mm each. The black lines shall show a reflection value R_y of maximum 10 percent, the white lines shall show a reflection value R_y of at least 90 percent. The reflection value of each single line is to be measured and stated once in horizontal direction and once under an angle of 45°. The resolution is sufficient if the measured reflection value R_y of each black line doesn't exceed 20 percent and the measured reflection value R_y of each white line exceeds 80 percent.

NOTES

1 If the resolution is not sufficient, it can be helpful to use a higher zoom resolution.

2 A possible supplier for adequate test charts is indicated in Clause **F-7**.

12.1.6.3 *Criteria of Validity*

Criteria of validity ensure an adequate comparison of different main tests. Results of the main test according to **12.1.5** are valid and shall only be accepted if following criteria are fulfilled.

a) Time $t \leq t_\mathrm{max}$ according to Table 7; and

b) Table 7 shows t_max for each diameter of the disc

Table 7 Maximum Time t_max for Each Size of Disc

(*Clause* 12.1.6.3)

Sl. No. (1)	**Cooking Zone Size Category** mm (2)	**Diameter of the Discs (outside)** mm (3)	t_max *Min* (4)
i)	≥ 100 < 130	120 ± 0.5	42
ii)	≥ 130 < 160	150 ± 0.5	42
iii)	≥ 160 < 190	180 ± 0.5	37
iv)	≥ 190 < 220	210 ± 0.5	34
v)	≥ 220 < 250	240 ± 0.5	32
vi)	≥ 250 < 280	270 ± 0.5	32
vii)	≥ 280 < 310	300 ± 0.5	30
viii)	≥ 310 ≤ 330	330 ± 0.5	30

a) Used setting

For checking the setting the actually used setting is calculated by the energy consumption and time stated in **12.1.5**. The actual setting shall work with the power density $0.9\ \mathrm{W/cm^2} \leq q \leq 1.2\ \mathrm{W/cm^2}$.

b) Browning intensity

For checking the browning intensity, the average lightness is determined using a digital evaluation system according to **12.1.6.2**. The browning intensity shall show an average reflection value within R_y 16.4 and 26.5.

NOTE — For visual check, NCS 10 -12 according to Annex D is required. The stated ranges for the digital evaluation and the visual assessment differ due to the fact that the shade charts and the floured discs have different spectral radiation characteristics.

If one of these three criteria is not fulfilled, the main test shall be repeated depending on the unfilled criteria with an increase of time or an adaption of the setting.

12.1.6.4 *Criteria for assessment*

a) Change of browning along diametral lines divide the floured disc diameter into 128 sections and determine the average shade numbers $\overline{SN_l}$ for each section according to Annex D. Consider the represented area of each line section by weighing the average shade numbers $\overline{SN_l}$ with the distance to the centre section, plus one. As a measure for the change of browning along this line calculate the gradient sum square $GS_{\mathrm{line}\ j}$ according to Formula (6).

$$GS_{\text{line }j} = \sqrt{\frac{\sum_{i=1}^{127} (\overline{SN_l} - \overline{SN_{l+1}})^2 \cdot (|64 - i| + 1)}{127}} \qquad (6)$$

where

i	is the respective section per line;
j	is the number of rotations of the line (*see* below), here $j = 1$;
$\overline{\mathrm{SN_l}}$	is the average shade number of each section; and
$GS_{\text{line }j}$	is the gradient sum square, line j.

Rotate the line by 15° eleven times and calculate $GS_{\text{line }j}$ for each line as shown in Figure 7. As a measure of the change of browning of the whole disc, calculate the overall gradient sum square of all twelve lines using Formula (7).

$$GS = \frac{\sum_{j=1}^{12} GS_{\text{line }j}}{\sqrt[2]{12}} \qquad (7)$$

where

GS is the overall gradient sum square.

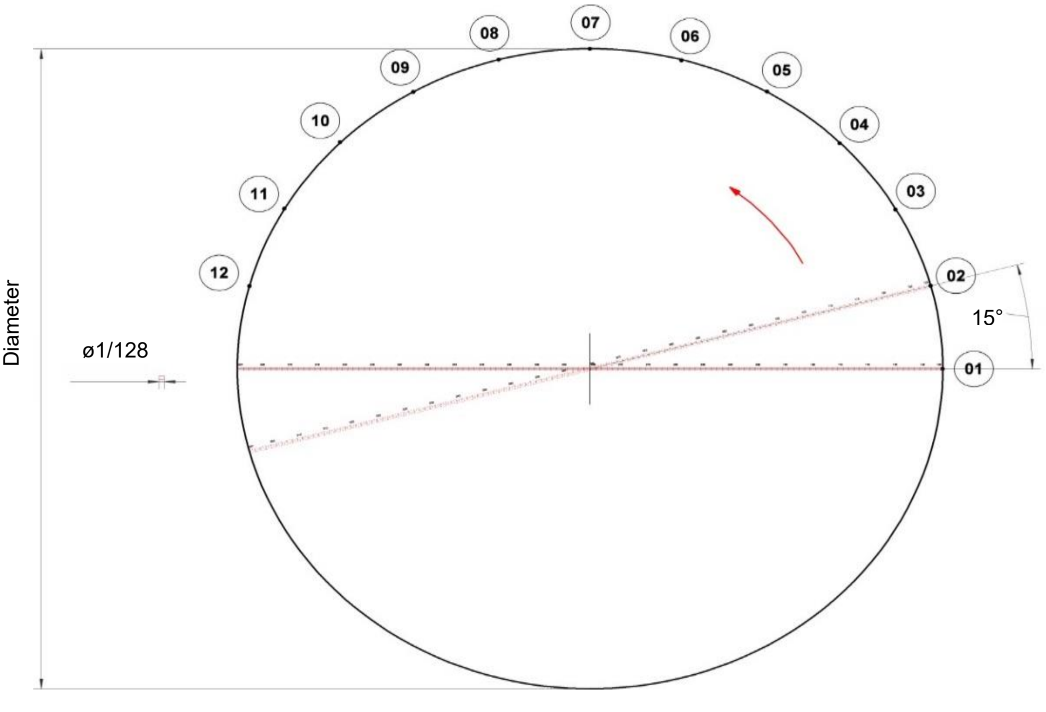


FIG. 7 DIAMETRAL LINES

a) Rotation symmetry

Determine the distance between the geometrical centre of the area to be assessed and the centre of mass of the image.

b) Standard deviation

Determine the standard deviation of the area to be assessed using the shadenumbers according to Annex D of the smallest detectable area.

c) Browning difference

The browning difference within the area to be assessed is calculated by the 95th percentile minus the 5th percentile of occurring shade numbers for the smallest detectable areas.

d) Not browned areas

Determine the percentage of not browned areas. Areas with a hue value $H \leq H_{\text{limit}}$ (specified in Table D-2) may be considered as not browned areas.

e) Dark centre

Determine if the floured disc shows a dark centre. The diameter of the centre is calculated by 0.3 times the diameter of the area to be assessed. The centre is considered as too dark if the average browning intensity is at least 2 shade numbers higher than the average browning intensity of the area to be assessed. Compliance is checked by inspection.

12.2 Measuring the Continuous Frying

12.2.1 *Purpose*

The purpose of this test is to determine whether the cooking zone can steadily maintain a moderately high temperature when frying continuously.

NOTES

1 This test is applicable for comparative testing only.

2 Currently this test is only applicable for cooking zones. Necessary adoptions for cooking areas are under consideration.

12.2.2 *Specification of the Frying Pan*

The assessment is made by frying a batch of pancakes in a frying pan.

a) Material: stainless steel bottom cladded with several layers, which typically clad a stainless steel layer (for example, AISI 430 or AISI 439 steel), an aluminium layer and a ferromagnetic layer often also called ‘sandwich layer bottom’ or ‘aluminium clad’;

b) Flatness: < 0.003 *a* at ambient temperature, where *a* is the outer diameter of the pan bottom. A convex shaped bottom plate is not allowed. The flatness of the base has to be checked before starting a measurement.

c) Thickness of the bottom: > 3 mm;

d) No aluminium or copper spots on the surface and without an aluminium ring on the outside;

e) No ferromagnetic disc bottom, ferromagnetic coating or sputtering;

f) Without reliefs and stamps, except one smaller stamp with a diameter less than 30 percent from the flat bottom diameter in the centre;

g) No magnetic sidewall;

h) Inner surface of the pan with non-stick surface coating, e.g. polytetrafluoroethylene (PTFE); and

j) Dimension: the size of pan shall match the size of the cooking zone (*see* **9.2**) as well as possible. However, it may vary by a maximum of +20 mm and −10 mm.

For determining the size of cookware, the outer diameter (*a*) of the flat bottom of the pan is measured. The used frying pan is stated. For comparative results, always the same design shall be used, even if different sizes are tested.

12.2.3 *Recipe for Pancakes*

The quantities of ingredients and approximate cooking durations corresponding to the diameter of the cooking zone are given in Table 8.

Table 8 Ingredients and Cooking Durations

(*Clause* 12.2.3)

Sl No.	**Ingredients**	**Diameter of the Cooking Zone** mm			
		≥ 130 and < 160	**≥ 160 and < 190**	**≥ 190 and ≤ 220**	**> 220 and ≤280**
(1)	(2)	(3)	(4)	(5)	(6)
i)	White wheat flour, without raising agent	140 g	140 g	200 g	280 g
ii)	Fresh milk, fat content 3% to 4%	270 g	270 g	400 g	540 g
iii)	Egg (without shell)	110 g	110 g	160 g	220 g
iv)	Salt	3 g	3 g	4 g	6 g
v)	Batter quantity for each pancake	45 ml	55 ml	85 ml	140 ml
vi)	Cooking duration for the first side	40 s to 60 s	50 s to 70 s	60 s to 80 s	70 s to 90 s

12.2.4 *Procedure*

Whisk milk and egg together, sieve the flour and salt together and add to the milk and egg mixture. Leave the batter to rest for one hour at room temperature before baking the pancakes. For the first pancake grease the frying pan only with a thin layer of vegetable oil. Heat the pan until the centre of the base has reached a temperature of (200 ± 5) °C measured by a contact probe. Pour the relevant quantity of batter into the pan.

Fry the pancake until bubbles appear in the upper surface and the batter has set (approximate times are shown in Table 8). Turn the pancake and fry until the second side is golden brown. Fry a total of eight pancakes, maintaining the same setting and the same orientation between the frying pan and the cooking zone.

A preliminary test may be necessary to determine the setting in order to achieve the specified range of cooking duration for each pancake stated (*see* Table 8).

12.2.5 *Assessment*

The evenness of browning of the side which is fried first is evaluated for each pancake, except the first one by using the shade chart of Annex D. The average browning of each pancake is determined. The maximum difference between these average values is stated. The measured value shall be within ± 5 percent of the declared value by the manufacturer.

13 HEAT PERFORMANCE OF COOKING ZONES

13.1 Purpose

Electronic components in hobs are used for thermal protection. Temperature sensors are integrated into the hob. The power to the cooking zones can be cut off when temperatures reach critical limits. Also, the electronic control system itself can require thermal protection. This design characteristic can alter the ability to heat food. The purpose of the test method is to determine the heating performance of hobs that have thermal protection.

NOTES

1 This test is applicable for comparative testing only.

2 Currently, this test is only applicable for cooking zones. Necessary adoptions for cooking areas are under consideration.

13.2 Procedure

Select pieces of alternative cookware according to **8.6.2**. Use the cookware with oil on the cooking zone that has the maximum diameter according to Table 9. On the other cooking zones, fill the cookware with water as indicated in Table 3. The water and the oil shall be at ambient temperature. The potato chips shall be frozen at (−18 ± 2) °C.

Table 9 Quantities for Heat Performance Test

(*Clause* 13.2)

Quantity of Fresh Sunflower Oil in the Cookware			
Diameter of Cooking Zone mm	**Quantity of Oil** l	**Quantity of Potato Chips** g	**Minimum Volume of the Cookware** l
≥ 130 and < 160	1	200	≥ 2.0
≥ 160 and < 190	2	350	≥ 3.6
≥ 190 and ≤ 220	3	500	≥ 5.5

The pieces of cookware filled with water are covered with glass lids. The temperature of the oil is recorded continuously by means of a thermocouple used as a sensor for the temperature measurement. The position of the thermocouple shall be 10 mm above the bottom of the cookware and at a distance of 10 mm from the side of the cookware. The cookware shall be centered on the cooking zones. Set the power level for all pieces of cookware to maximum power.

For a cooking range equipped with an oven, the oven is to be operated. Set the thermostat so that the mean oven temperature is (180 ± 5) °C for ovens with forced air circulation and (200 ± 5) °C for ovens with natural convection. Operate the oven with the door closed and be sure it is empty. When the oven reaches the temperature, or after a maximum time of 20 min, set power level for all pieces of cookware to maximum power.

An oven with a “cooling” fan can have a favourable influence on the thermal characteristics of the hob; in this case, the oven is not operated. A cooling fan is not the same as a convection fan. A convection fan is visible in the rear of the oven cavity. After the water starts to boil, adjust the controls so that the water boils gently during the relevant test time.

When the temperature of the oil reaches (180 ± 5) °C, remove one portion of potato chips according to Table 9 from the freezer and transfer it to the oil immediately. Fry for the time specified in Table 10.

Table 10 Frying Times for Potato Chips

(*Clause* 13.2)

Sl. No. (1)	**Diameter of cookingzone** mm (2)	**Time** *Min* (3)
i.	≥ 130 and < 160	4
ii.	≥ 160 and < 190	5
iii.	≥ 190 and ≤ 220	7

If the temperature of the oil has dropped below (180 ± 5) °C during frying, wait after the potato chips are taken out until the oil is heated up again at maximum setting to (180 ± 5) °C before putting the next portion of potato chips into the oil. This is to prevent the oil from cooling down gradually during the test. If the oil temperature rises over (180 ± 5) °C, reduce the setting. This procedure is continued for 45 min after the cooking zones are switched on.The following values should be recorded:

a) the heat-up time for the oil to reach 180 °C, in *Min*;
b) the heat-up time for the oil to reach 180 °C again, after taking out a portion of potato chips, in *Min*;
c) the number of potato chip portions fried during the test.

The compliance is checked by inspection.

14 SMALLEST DETECTED DIAMETER FOR INDUCTION COOKING ZONES

14.1 Purpose

Induction cooking zones may incorporate an electronic cookware detection means which automatically cuts off the power to the cooking zone concerned when no cookware or cookware with too small a diameter is placed on the cooking zone, or a detected piece of cookware is removed from the cooking zone.

The purpose of the test method is to determine the smallest diameter that is detected on the cooking zone under test.

NOTES

1 The detected diameter, measured with a disc may not be identical to the base diameter of a piece of cookware. This depends from the design and material of cookware.

2 The purpose of this test is not to grant a specific power to this smallest diameter.

14.2 Procedure

Discs as defined in Figure 8 are used, each being at ambient temperature at the beginning of the test. The test is started with a disc with a diameter that definitely will not be detected by the cooking zone to be tested.

The disc is made from steel with the chemical composition in weight in percentage as given below:

a) 0.42-0.50 percent C
b) < 0.40 percent Si
c) 0.50-0.80 percent Mn
d) < 0.045 percent S
e) < 0.045 percent P
f) 0.40 percent Ni
g) < 0.40 percent Cr
h) 0.10 percent Mo
i) Cr + Mo + Ni ≤ 0.63 percent.

NOTE — This steel is for example equivalent to EN C45 (defined in EN 10277 -2) and SAE 1045. A possible supplier of the disc for testing purpose is mentioned in Clause **F-2**.

Place the disc in the centre of the cooking zone marked on the appliance. Set the control to the lowest power level. If the disc is not detected by the cookware detection means, the test is to be done with a disc having a diameter 5 mm larger. This procedure is to be repeated until a disc is detected and is working continuously for at least 1 min.

The detected diameter shall be verified in the hot condition. To do this: bring up the amount of water according to Table 3 to the boiling point at maximum possible power level simultaneously on all cooking zones available on the hob. For that test any suitable cookware which covers the size of the cooking zone should be used. Remove all pieces of cookware after the water on one cooking zone has started boiling. Set the control to the lowest power level again and then check on one cooking zone after the other separately if the disc that was determined before is still detected over the whole voltage range of 94 percent to 110 percent of nominal voltage (*see* 8.2).

If verifying fails, the test is to be repeated with the next largest disc diameter. The smallest detected diameter is defined as the smallest diameter of the disc that wasdetected under all conditions mentioned above. The test is repeated for all cooking zones in a hob. The smallest detected diameter shall be within ± 5 percent of the declared value by the manufacturer.

Dimensions in millimetres

Table:

ø*D*	⏥
D < 120	0.1
120 ≤ D < 150	0.15
150 ≤ *D*	max. 0.2

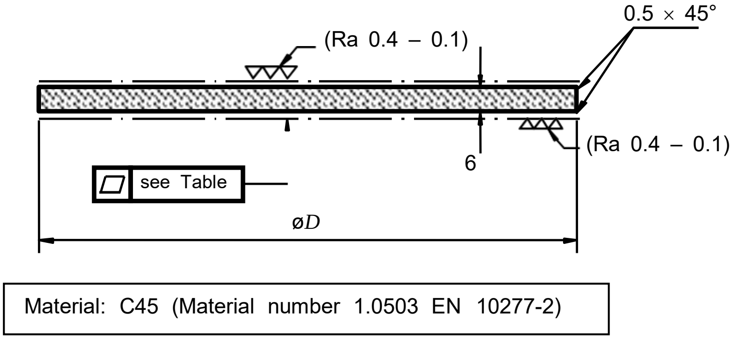


FIG. 8 DISC TO DETERMINE THE SMALLEST DETECTED DIAMETER

15 POWER MEASUREMENT OF LOW POWER MODES

In addition to IEC 62301, the following requirements for measuring the power of low power modes are given.

For an appliance composed of a combination of separate units, which may consist of one of a variety of different hobs and one of a variety of different ovens, the recommended combination as declared in the manual instruction is used for the test.

If appliance A, for example hob, can only be operated combined with appliance B, for example oven, first the low power for appliance B without appliance A is measured and noted. Afterwards, the low power for the appliance B combined with the appliance A is measured. The low power of appliance A is calculated by the difference between these two measurements.

When preparing the test report for an appliance composed of a combination of separate units, the combination of types of main powered parts (hobs, ovens, grills, warming plates, griddles, etc) used for the measurement shall be recorded. The low power shall be noted for each unit A and B separately.

If testing appliances fitted with a clock, the clock shall be adjusted to the current time and date following the manufacturer’s instructions.

In case the low power level is influenced by the continuous changing of the displayed time of a clock, a measurement period of 24 h is necessary. The value of this measurement is noted.

If the appliance has an ambient light sensor, two illuminance levels in accordance with IEC 62301 shall be measured during the 24 h period, each illuminance level for 12 h.

If an option is provided to the user to switch off the display, both the switched on and switched off modes are to be tested and recorded.

The standby power consumption shall not be more than 0.8 W.

16 SPILLAGE CAPACITY OF HOBS

The purpose of this test is to evaluate the capability of the hob to retain spillage.

NOTE — This test is considered to give reproducible results.

The appliance is positioned so that the perimeter of the hob surface is horizontal. A cookware which has the smallest diameter required to cover the cooking zone is placed on one of the cooking zones and completely filled with water. An additional quantity of 0.5 litre of water is poured steadily into it within 1 min. The effect of this spillage is determined and stated. If the hob does not hold the excess quantity, it is stated whichway the water runs.

The quantity of water that the hob will retain before it overflows is measured and stated in ml. The measured value shall be within ± 5 percent of the declared value by the manufacturer.

17 TESTS

17.1 Tests are classified as type, acceptance and routine tests.

17.2 Type Tests

The test specified in Table 11 below shall constitute the type tests and shall be carried out on two samples of the same type and rating selected preferably at random from a regular production lot. Before commencement of the tests, the water heaters shall be visually examined and inspected for obvious visuals defects in respect of components, parts and their assembly, construction, stability, markings, provision of suitable terminals for supply connections, earthing and the effectiveness of screws and connections. The external surface finish shall be even and free from finishing defects.

Table 11 Schedule of Type Tests
(*Clause* 17.2)

Sl No. (1)	**Tests** (2)	**Clause Reference** (3)
i)	Safety requirements	**6**
ii)	Dimension and mass	**9**
iii)	Energy consumption and heating up time	**10**
iv)	Ability to control the temperature of a load	**11**
v)	Heat distribution and heat supply	**12**
vi)	Heat performance of cooking zones	**13**
vii)	Smallest detected diameter for induction cooking zones	**14**
viii)	Stand by power and power measurement of low power mode	**15**
ix)	Spillage capacity of hobs	**16**

17.1.1 *Criteria of Acceptance*

All samples shall successfully pass all the type test for proving conformity with the requirements of the standard. If any of the samples fails in any of the type tests, the testing authority, at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) occurred. No failure should be permitted in the repeat test(s).

17.2 Acceptance Tests

The following shall constitute the acceptance test:

Tests	*Clause Reference*
a) Protection against access to live parts	**8** of IS 302-2-6
b) Power input and current	**10** of IS 302-2-6
c) Heating	**11** of IS 302-2-6
d) Leakage current and electric strength at operating temperature	**13** of IS 302-2-6
e) Moisture resistance	**15** of IS 302-2-6
f) Leakage current and electric strength (After humidity treatment)	**16** of IS 302-2-6

g) Construction	**22** of IS 302-2-6
h) Provision for earthing	**27** of IS 302-2-6
j) Determination of mass	**9**
k) Energy consumption and heating up time	**10**
m) Heat distribution and heat supply	**12**
n) Heat performance of cooking zones	**13**
p) Spillage capacity of hobs	**16**

NOTE — For the purpose of acceptance tests, the humidity treatment is done for 24 h while conducting the test for moisture resistance (*see* **15** of IS 302-1).

17.3 Routine Test

The following tests shall constitute the routine tests:

Test	*Clause Reference*
a) Earth continuity test	**A-1** *of IS 302-1*
b) Electric strength	**A-2** *of IS 302-1*
c) Functional test	**A-3** *of IS 302-1*

ANNEX A

(*Clause* 10)

A-1 GENERAL

For cooking areas, the following requirements are in addition to those in **10.**

A-2 HOB WITH COOKING AREA

A-2.1 General

A-2.2 Cooking Area Without Limitative Marking

For a hob with a cooking area, the cookware set is selected depending on the layout. If a hob is a combination of **A-2.2** and **A-2.3**, then these areas will be tested separately. If a hob has more than one cooking area with limitative marking (*see* **A-2.3**), each cooking area is tested separately.

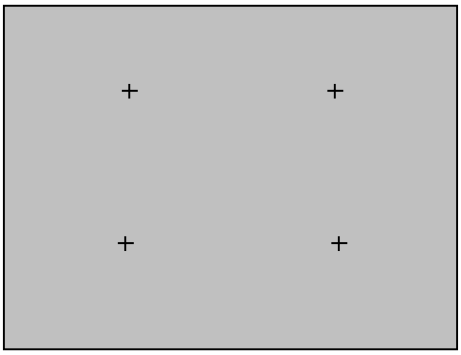


FIG. A-1 LAYOUT FOR A HOB WITH COOKING AREA WITHOUT LIMITATIVE MARKING – EXAMPLE

The number of controls determines the number of cookware pieces. The number of controls is defined by the number of pieces of cookware that can beused independently on the cooking area all together at the same time.

Table A-1 Criteria for the Cookware Set for Measuring Cooking Areas Without Limitative Marking

Sl No. (1)	**Number of Controls** (2)	**Selected Cookware Set (Standardized Cookware)** (3)
i)	1	One cookware with a diameter of 210 mm
ii)	2	Two cookware pieces with a diameter of 180 mm and 210 mm
iii)	3	Three cookware pieces with a diameter of 150 mm, 180 mm and 210 mm
iv)	4	Four cookware pieces with a diameter of 150 mm, 180 mm and 210 mm twice
v)	5	Five cookware pieces with a diameter of 150 mm, 180 mm, 210 mm twice and 240 mm
vi)	6	Six cookware pieces with a diameter of 150 mm, 180 mm twice, 210 mm twice and 240 mm

NOTE — Further specification (lid, height etc) for cookware pieces are fixed in **8.6.1**.

If a piece of cookware is not detected, the next biggest cookware diameter is chosen independently of the cookware category (see Table 3).

If a selected cookware size is out of the range of the sizes allowed by the user manual,then the closest diameter compatible with the defined range shall be chosen.

A-2.3 Hob with Cooking Area with Limitative Marking

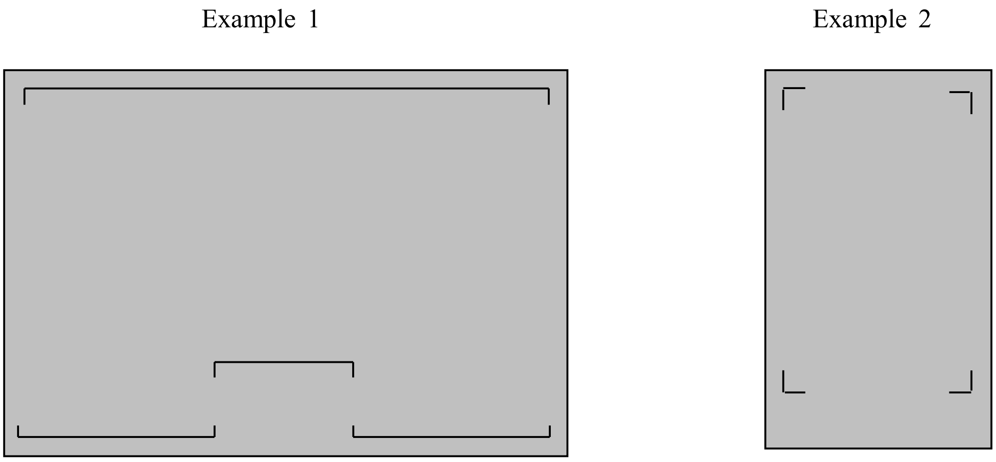


FIG. A-2 LAYOUTS FOR A HOB WITH A COOKING AREA WITH LIMITATIVE MARKING – EXAMPLES

If the cooking area has a limitative marking that marks the area where more than one cookware can be used simultaneously, the cookware set is selected according to Table A-2.

Table A-2 Criteria for the Cookware set for Measuring Cooking Areas with Limitative Marking
(*Clause* A-2.3)

Sl No. (1)	**Number of Controls** (2)	**Selected Cookware Set (Standardized Cookware)** (3)
i)	≤ 3	Three cookware pieces with a diameter of 150 mm, 180 mm and 210 mm
ii)	> 3	Five cookware pieces with a diameter of 150 mm 180 mm 210 mm twice 240 mm

NOTE — Further specifications (lid, height etc) for the cookware are fixed in **8.6.1**.

If a piece of cookware is not detected, the next biggest cookware diameter is chosen independently of the cookware category (*see* Table 3). If a selected cookware size is out of the range of the sizes allowed by the manual instruction, then the closest diameter compatible with the defined range shall be chosen. The number of controls is defined by the number of pieces of cookware that can be used independently on the cooking area all together at the same time.

A-2.4 Hob with Cooking Zones and Cooking Areas

The cookware for the cooking zones and the cooking areas in one hob is selected independently. The cookware set for a combination of cooking areas and cooking zones in one hob is selected for the cooking zones according to **10** and for the cooking area according to Annex A.

A-3 POSITIONING ON A COOKING AREA

A-3.1 General

All hob markings/centre positions are considered in the test. Symbols on controls should be considered to define the cookware position.

A-3.2 Positioning on a Cooking Area Without Limitative Markings

The biggest cookware piece has to be placed on a cooking area without limitative markings in accordance with the following order of precedence:

a) having highest maximum power;
b) being located at the rear of the hob; and
c) being located at the left.

NOTE — Different sizes of markings are not considered.

The other pieces of cookware are positioned following the same order of precedence.

A-3.3 Positioning on a Cooking Area with Limitative Markings

A-3.3.1 *Cooking Area with Limitative Marking and with ≤ 3 Controls*

The largest piece of cookware is positioned in the centre of the cooking area. To find the centre the longest vertical and horizontal line within the marking is determined. In this case the wording "horizontal" and "vertical" refer to the drawing layer, *see* Fig. **A-3**.

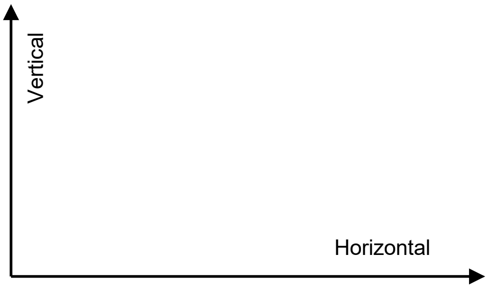
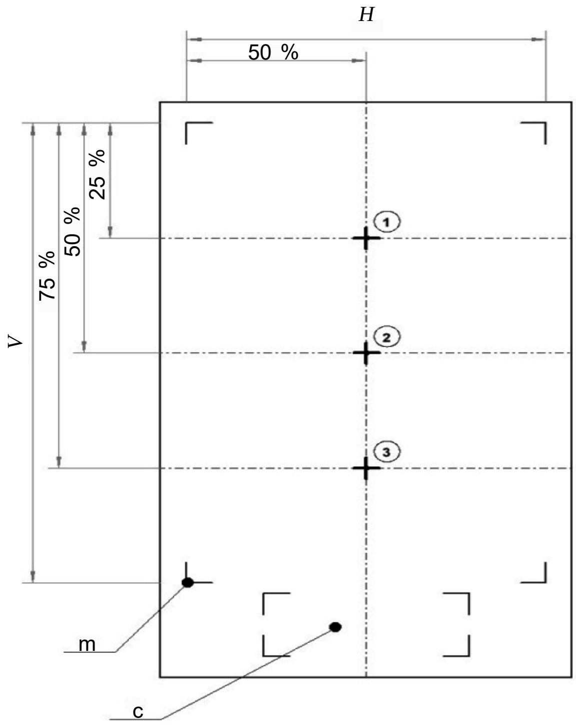


FIG. A-3 DRAWING LAYER

Bisect the shorter line and move the longer line parallel to this half distance point. Intersect the longest possible line at 25 percent, 50 percent and 75 percent. 25 percent determines the position marker ① in Figure A-3, 50 percent determines the position marker ② and 75 percent determines position marker ③.

The position marker ② determines the centre for the largest piece of cookware. If it is written in the manual instruction that in this position ② only non-circular cookware can be used this position and related cookware size is not tested. The smaller pieces of cookware are positioned centrally on the position marker ① and ③, (*see* Fig. **A-4**)



Key

H	longest horizontal line of the marked cooking area
V	longest vertical line of the marked cooking area
c	area of the control
m	limitative marking of the cooking area
①, ③	position marker of the pieces of cookware with a 150 mm diameter and a 180 mm diameter
②	centre position of cookware with a 210 mm diameter

FIG. A-4 POSITION A COOKWARE SET ON A COOKING AREA WITH LIMITATIVE MARKINGS ≤ 3 CONTROLS – EXAMPLE

The next biggest cookware piece has to be placed in accordance with the following order of precedence:

a) position marker being located at the rear of the hob; and
b) position marker being located at the left.

If a cookware is not detected at the described position, for this position the next biggest cookware diameter is chosen independently of the cookware category (*see* Table 3). The positions and sizes of the pieces of cookware used for measuring shall be noted.

A-3.3.2 *Cooking area with Limitative Marking and with > 3 Controls*

First the longest possible horizontal and vertical lines within the marked area which shows the limits where the cookware is used are determined. Bisect the vertical line and move the horizontal line parallel to this half distance point.

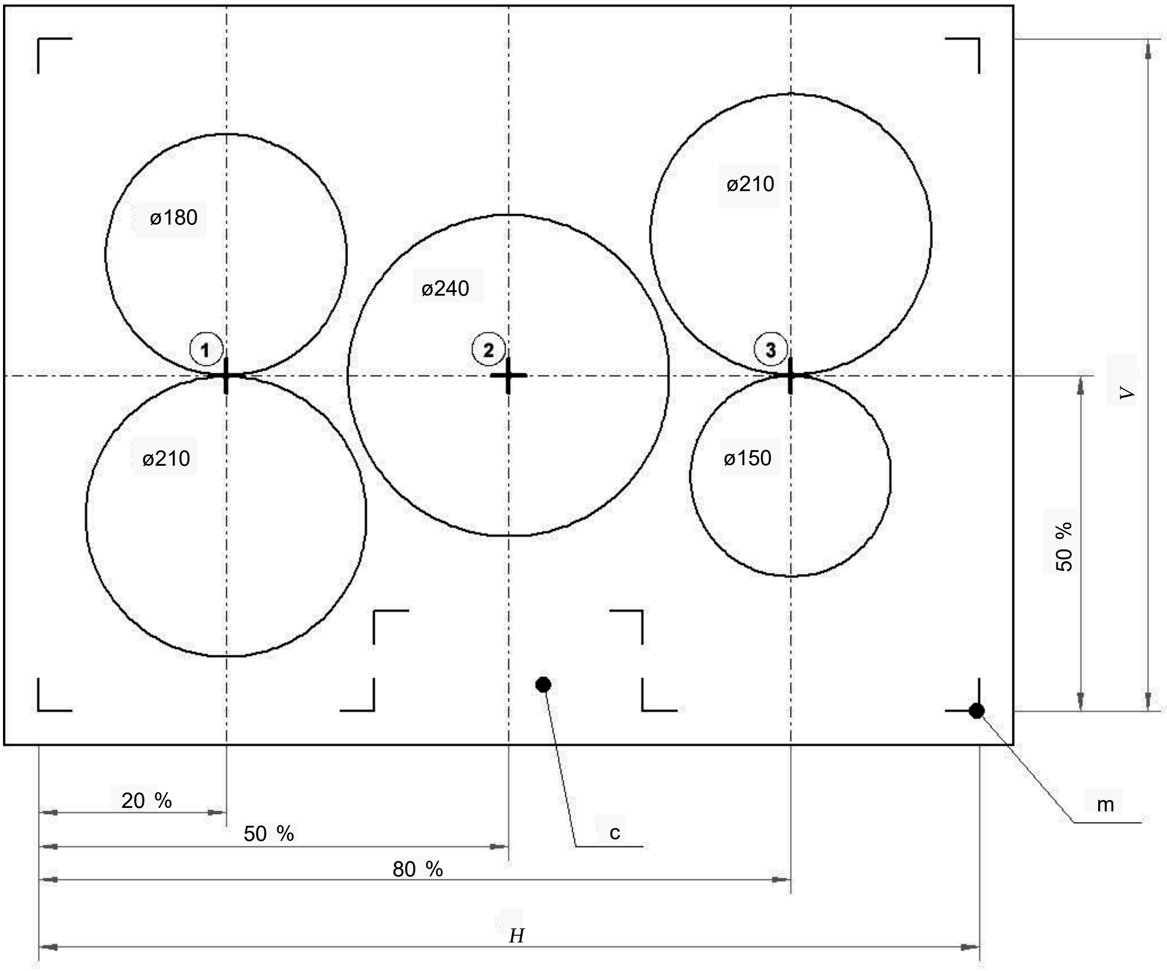
Intersect the horizontal line (longest possible) at 20 percent, 50 percent and 80 percent. 20 percent determines the position marker ① in Fig. A-5, 50 percent determines the position marker ② and 80 percent determines position marker ③. The position marker ② determines the centre for the largest piece of cookware. The smaller pieces of cookware are positioned tangentially (the outer radius of the cookware bottom touches the position markers) one above and one below the horizontal line at the position markers and (*see* Fig. A-4).

The two pieces of cookware with the diameter of 210 mm are positioned one below the position marker ① and one above the position marker ③. The cookware with the diameter of 180 mm is set above the position marker ① and the cookware with a 150 mm diameter is below the position marker ③. If a piece cookware is not detected at the described position, for this position the next biggest cookware diameter is chosen independently of the cookware category (*see* Table 3).

If the position of the specified cookware causes the cookware to partially cover the control, then the cookware shall be moved away until the cookware no longer covers the control. Moreover, all pieces of cookware shall be as far as possible within the marked area. If necessary, the biggest piece of cookware on position marker ② is shifted first vertically, then horizontally. The other pieces of cookware are shifted first horizontally, then vertically. The pieces of cookware should be shifted as little as possible. If the shifting in the first direction is not effective, it can be skipped.

The positions and sizes of the pieces of cookware used for measuring shall be noted. If it is not clear which cookware position is correct, all possibilities are considered. An example is listed in Fig. A-5.

Dimension in millimetres



Key

H longest horizontal line of the marked cooking area

V longest vertical line of the marked cooking area

c area of the control

m limitative marking of the cooking area

①,③ position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter

② centre position of cookware with 240 mm diameter

FIG. A-5 POSITION A COOKWARE SET ON A COOKING AREA WITH LIMITATIVE MARKINGS > 3 CONTROLS – EXAMPLE

The area of the control, c, can also be on the side, the position of the cookware set is the same. Examples for positioning the pieces of cookware are listed in Annex C.

ANNEX B

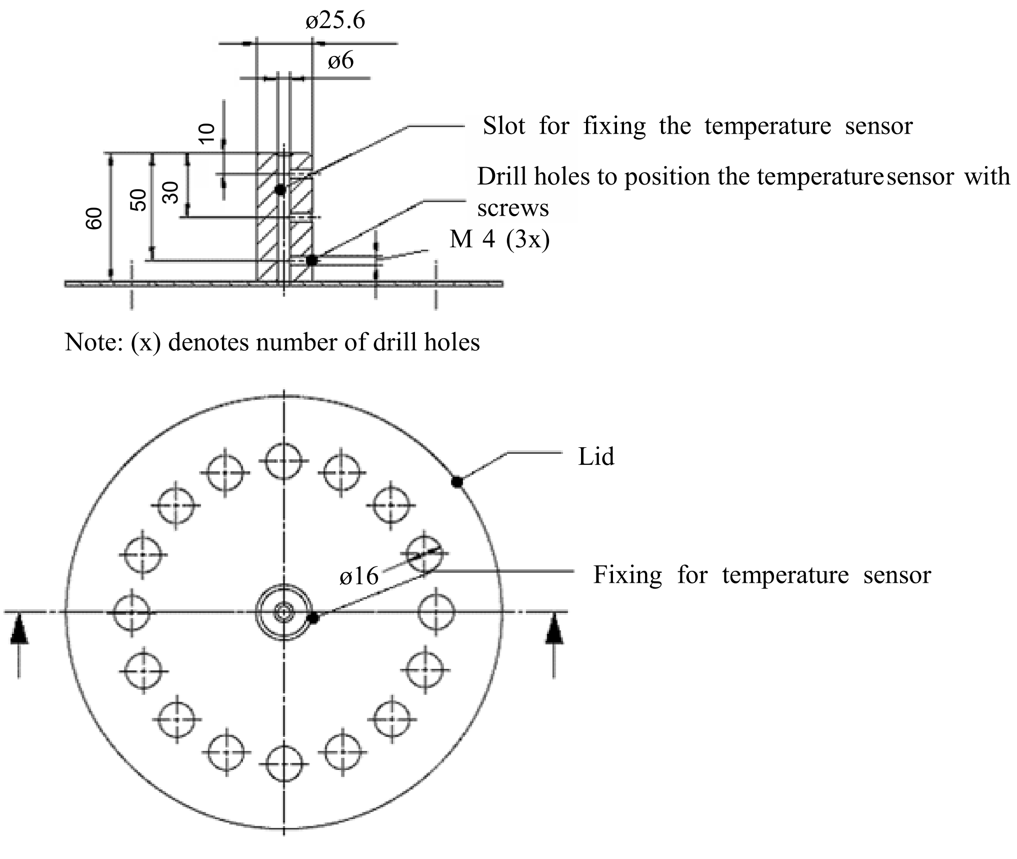
(*Clause* 8.6)

AIDS FOR MEASURING THE ENERGY CONSUMPTION ACCORDING TO CLAUSE 10

B-1 FIXING THE TEMPERATURE MEASUREMENT INSTRUMENT TO THE LID – EXAMPLE

The temperature measurement instrument according to **8.3** should be fixed in the centre of the lid (*see* **8.6.1**) as shown in Fig. B.1. The mounting part shall be made of plastic material. Screws are used in order to position the temperature sensor correctly.

Dimensions in millimetres


ø25.6
ø6
10
50
30
60
Slot for fixing the temperature sensor
Drill holes to position the temperature sensor with screws
M 4 (3x)
Lid
ø16
Fixing for temperature sensor

Note: (x) denotes number of drill holes

FIG. B-1 POSITION OF THE TEMPERATURE MEASUREMENT INSTRUMENT

B-2 MARKING THE LOWEST POSSIBLE SIMMERING POWER SETTING

For marking the lowest possible simmering power setting on the panel, a polar coordinate paper as shown in Fig. B-2 can be useful. Polar coordinate paper has concentric circles divided into small arcs to allow an exact marking around a knob.

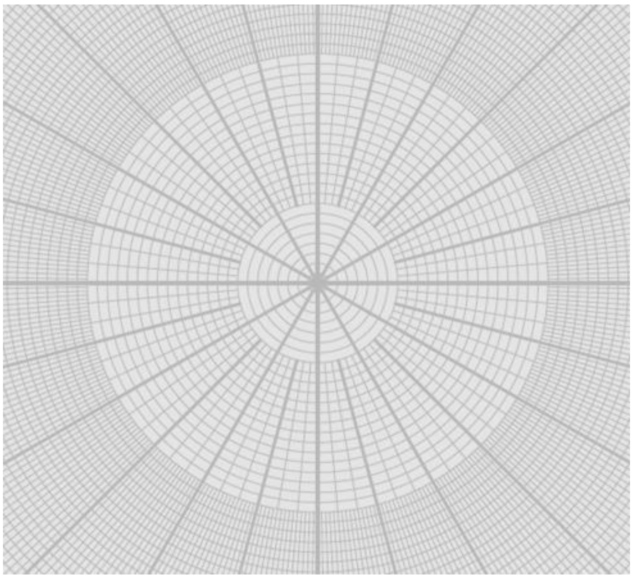


FIG. B-2 POLAR COORDINATE PAPER – EXAMPLE

ANNEX C

(*Clause* 10 *and Annex* A)

EXAMPLES HOW TO SELECT AND POSITION THE COOKWARE FOR MEASUREMENTS ACCORDING TO CLAUSE 10 AND ANNEX A

C-1 EXAMPLE 1 – COOKING ZONES

Fig. C-1 illustrates a hob with cooking zones.

Dimensions in millimetres

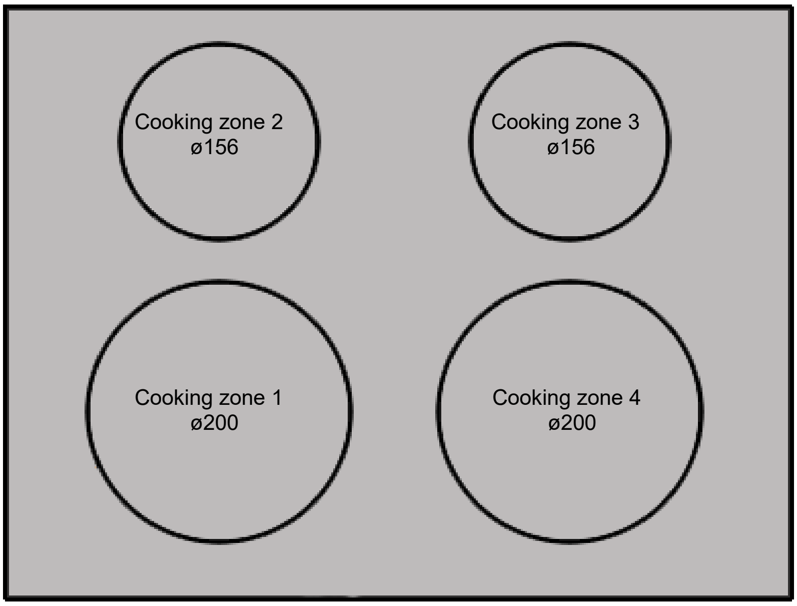


FIG. C-1 EXAMPLE 1: TUBULAR HOTPLATES, SOLID HOTPLATES, RADIANT COOKING ZONE OR INDUCTION COOKING ZONE

Fig. C-2 Provides Guidance for Selecting and Positioning Cookware on a Hob With Cooking Zones

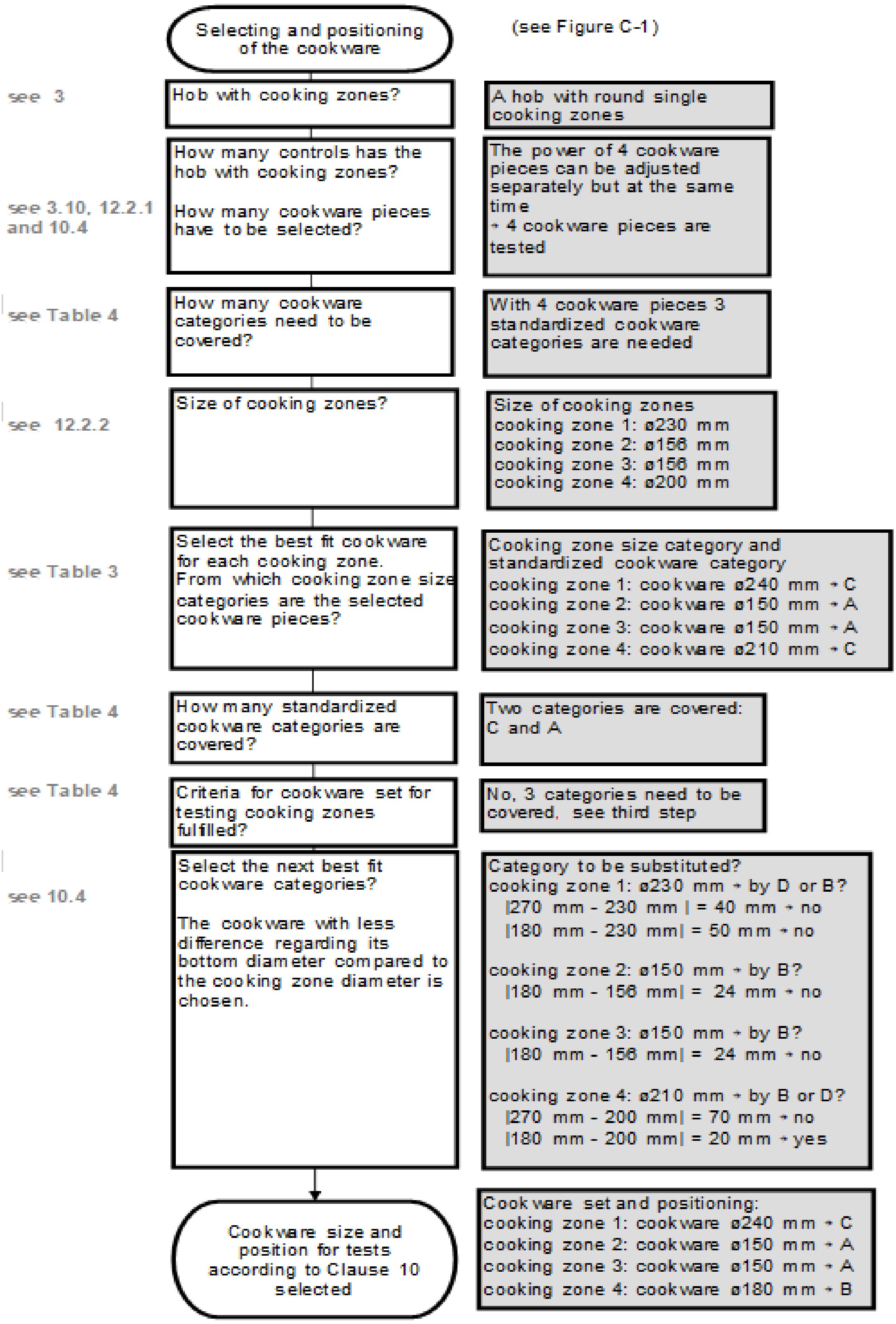

Selecting and positioning of the cookware
(see Figure C-1)
see 3
Hob with cooking zones?
A hob with round single cooking zones
see 3.10, 12.2.1 and 10.4
How many controls has the hob with cooking zones?
How many cookware pieces have to be selected?
The power of 4 cookware pieces can be adjusted separately but at the same time
→ 4 cookware pieces are tested
see Table 4
How many cookware categories need to be covered?
With 4 cookware pieces 3 standardized cookware categories are needed
see 12.2.2
Size of cooking zones?
Size of cooking zones
cooking zone 1: ø230 mm
cooking zone 2: ø156 mm
cooking zone 3: ø156 mm
cooking zone 4: ø200 mm
see Table 3
Select the best fit cookware for each cooking zone.
From which cooking zone size categories are the selected cookware pieces?
Cooking zone size category and standardized cookware category
cooking zone 1: cookware ø240 mm → C
cooking zone 2: cookware ø150 mm → A
cooking zone 3: cookware ø150 mm → A
cooking zone 4: cookware ø210 mm → C
see Table 4
How many standardized cookware categories are covered?
Two categories are covered: C and A
see Table 4
Criteria for cookware set for testing cooking zones fulfilled?
No, 3 categories need to be covered, see third step
see 10.4
Select the next best fit cookware categories?
The cookware with less difference regarding its bottom diameter compared to the cooking zone diameter is chosen.
Category to be substituted?
cooking zone 1: ø230 mm → by D or B?
|270 mm - 230 mm | = 40 mm → no
|180 mm - 230 mm| = 50 mm → no
cooking zone 2: ø150 mm → by B?
|180 mm - 156 mm| = 24 mm → no
cooking zone 3: ø150 mm → by B?
|180 mm - 156 mm| = 24 mm → no
cooking zone 4: ø210 mm → by B or D?
|270 mm - 200 mm| = 70 mm → no
|180 mm - 200 mm| = 20 mm → yes
Cookware size and position for tests according to Clause 10 selected
Cookware set and positioning:
cooking zone 1: cookware ø240 mm → C
cooking zone 2: cookware ø150 mm → A
cooking zone 3: cookware ø150 mm → A
cooking zone 4: cookware ø180 mm → B

FIG. C-2 EXAMPLE 1: SELECTING AND POSITIONING OF COOKWARE

C-2 EXAMPLE 2 – COOKING ZONES COMBINED WITH COOKING AREAWITH LIMITATIVE MARKINGS

Fig. C-3 illustrates a hob with one cooking area and two cooking zones.

Dimensions in millimetres

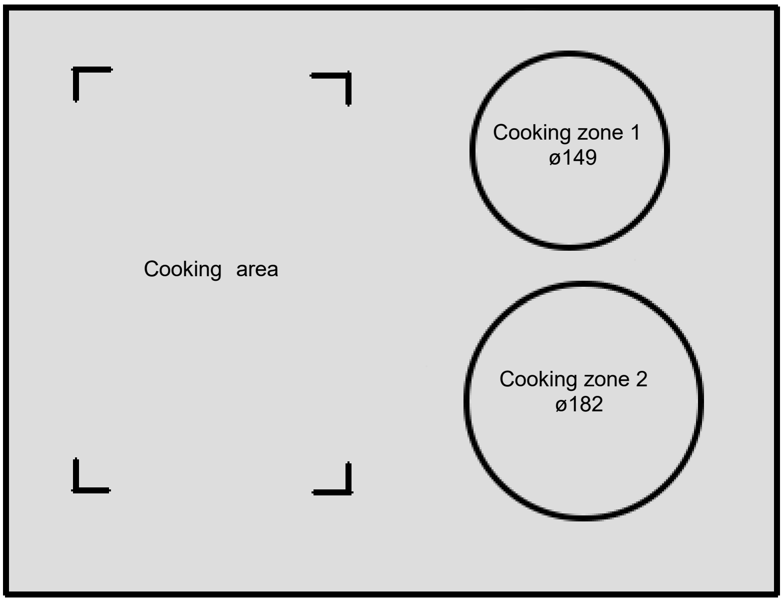
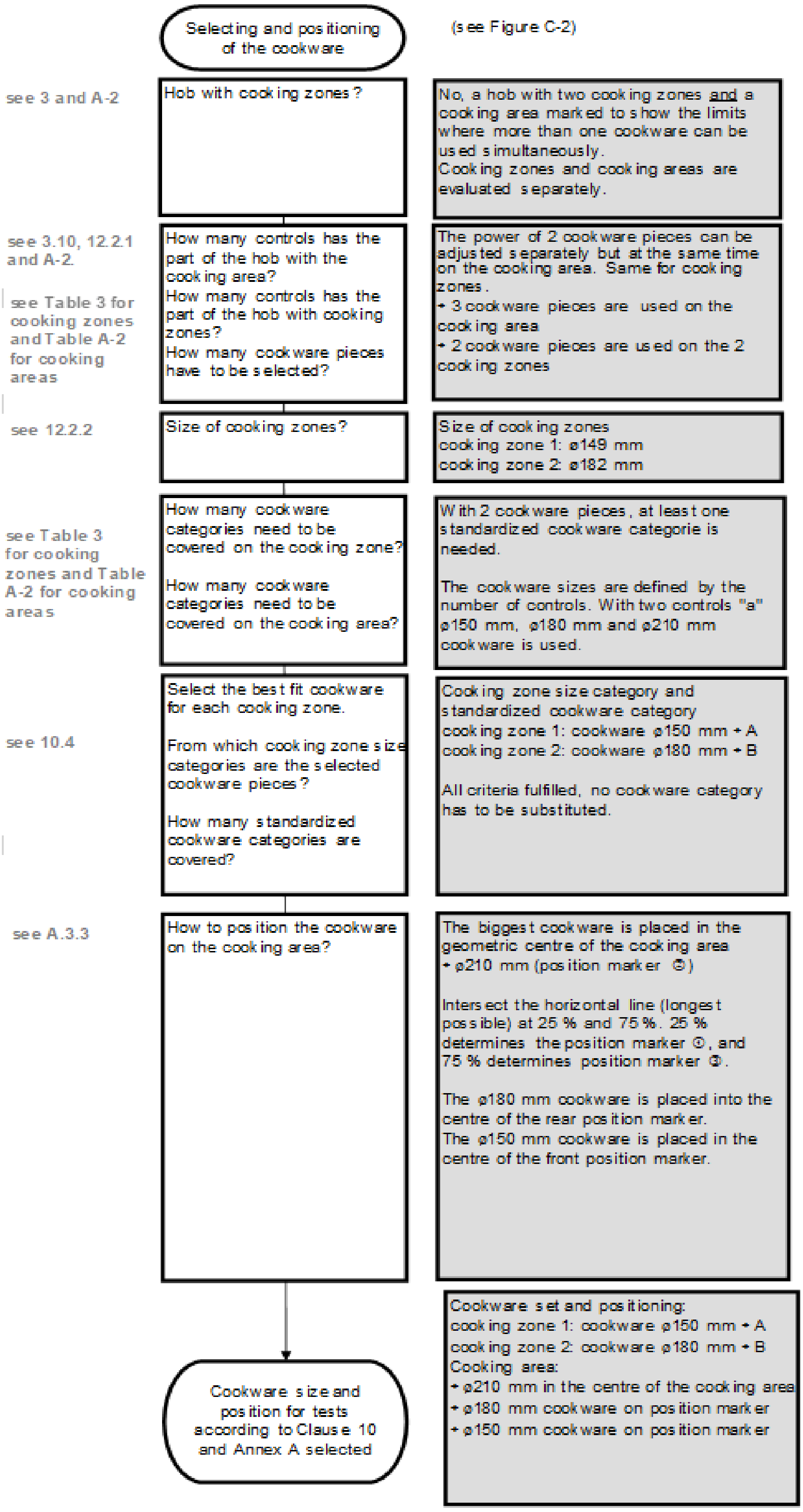


FIG. C-3 EXAMPLE 2: INDUCTION OR RADIANT COOKING ZONES COMBINED WITH A COOKING AREA WITH LIMITATIVE MARKINGS

Figure C-4 provides guidance for selecting and positioning cookware on a hob with a cooking area and cooking zones.

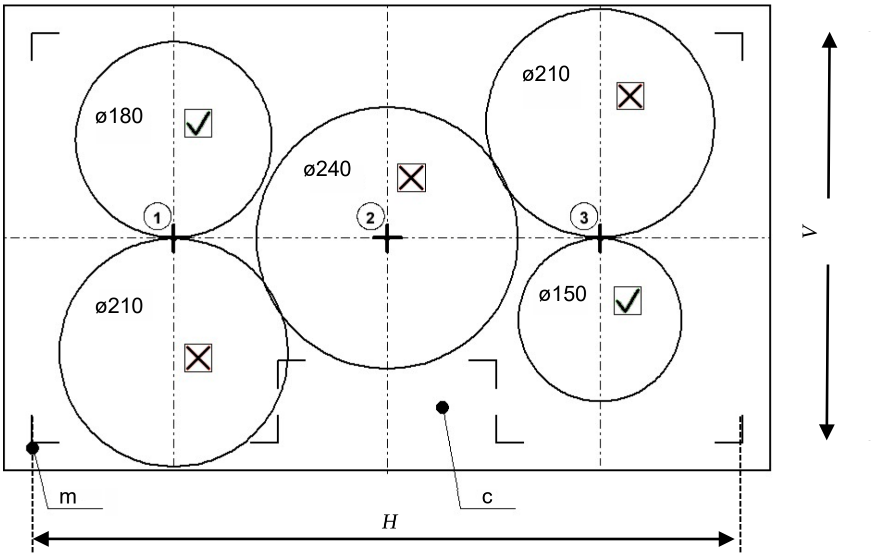


	Selecting and positioning of the cookware	(see Figure C-2)
see 3 and A-2	Hob with cooking zones?	No, a hob with two cooking zones and a cooking area marked to show the limits where more than one cookware can be used simultaneously. Cooking zones and cooking areas are evaluated separately.
see 3.10, 12.2.1 and A-2 see Table 3 for cooking zones and Table A-2 for cooking areas	How many controls has the part of the hob with the cooking area? How many controls has the part of the hob with cooking zones? How many cookware pieces have to be selected?	The power of 2 cookware pieces can be adjusted separately but at the same time on the cooking area. Same for cooking zones. → 3 cookware pieces are used on the cooking area → 2 cookware pieces are used on the 2 cooking zones
see 12.2.2	Size of cooking zones?	Size of cooking zones cooking zone 1: ø149 mm cooking zone 2: ø182 mm
see Table 3 for cooking zones and Table A-2 for cooking areas	How many cookware categories need to be covered on the cooking zone? How many cookware categories need to be covered on the cooking area?	With 2 cookware pieces, at least one standardized cookware categorie is needed. The cookware sizes are defined by the number of controls. With two controls "a" ø150 mm, ø180 mm and ø210 mm cookware is used.
see 10.4	Select the best fit cookware for each cooking zone. From which cooking zone size categories are the selected cookware pieces? How many standardized cookware categories are covered?	Cooking zone size category and standardized cookware category cooking zone 1: cookware ø150 mm → A cooking zone 2: cookware ø180 mm → B All criteria fulfilled, no cookware category has to be substituted.
see A.3.3	How to position the cookware on the cooking area?	The biggest cookware is placed in the geometric centre of the cooking area → ø210 mm (position marker ②) Intersect the horizontal line (longest possible) at 25 % and 75 %. 25 % determines the position marker ①, and 75 % determines position marker ③. The ø180 mm cookware is placed into the centre of the rear position marker. The ø150 mm cookware is placed in the centre of the front position marker.
	Cookware size and position for tests according to Clause 10 and Annex A selected	Cookware set and positioning: cooking zone 1: cookware ø150 mm → A cooking zone 2: cookware ø180 mm → B Cooking area: → ø210 mm in the centre of the cooking area → ø180 mm cookware on position marker → ø150 mm cookware on position marker

FIG. C-4 EXAMPLE 2: SELECTING AND POSITIONING OF COOKWARE

C-3 EXAMPLE 3 – COOKING AREA WITH LIMITATIVE MARKINGS > 3CONTROLS WITH THE AREA OF CONTROL IN FRONT

Dimensions in millimetres



Key

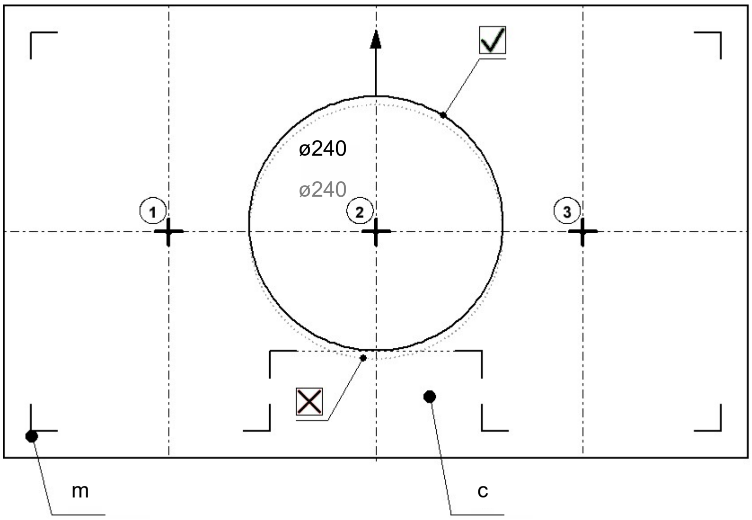
H	longest horizontal line of the marked cooking area
V	longest vertical line of the marked cooking area
c	area of the control
m	limitative marking of the cooking area
①,③	position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter
②	centre position of cookware with 240 mm diameter
☑	correct position
☒	wrong position, cookware has to be shifted

Fig. C-5 Example 3: Cooking Area with Limitative Markings > 3 Controls with the Area of the Control in Front

Five cookware pieces with a diameter of 150 mm, 180 mm, 210 mm twice and 240 mm are applied and positioned as shown in Fig. C-5. The cookware with 240 mm covers partially the area of the control and also the cookware with 210 mm below the horizontal line. Additionally, both pieces of cookware with 210 mm diameters are outside the marked area. Correct the position of the pieces of cookware with 240 mm and 210 mm diameters shown in example 3 in the following 2 steps:

1) Example 3:
   Move the cookware 240 mm vertically until the area of control is no longer covered (direction shown by arrow in Fig. C-6).

Dimensions in millimetres



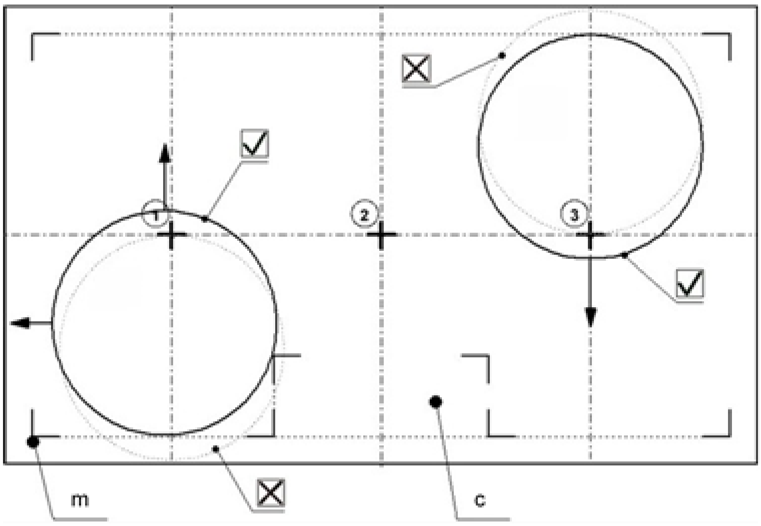
Key

c	area of the control
m	limitative marking of the cooking area
①,③	position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter
②	centre position of cookware with 240 mm diameter
☑	correct position
☒	wrong position, cookware has to be shifted

FIG. C-6 EXAMPLE 3: PROCEDURE HOW TO SHIFT THE COOKWARE INTO THE CORRECT POSITION – STEP 1

2) Example 3: Move the cookware (210 mm) below the horizontal line horizontally until the area of control is no longer covered. Additionally, this piece of cookware is moved vertically until the complete cookware is within the marked area. For the cookware (210 mm) above the horizontal line, a horizontal movement is not effective. Move this cookware vertically until the cookware is within the marked area (*see* Fig. C-7).

Dimensions in millimetres



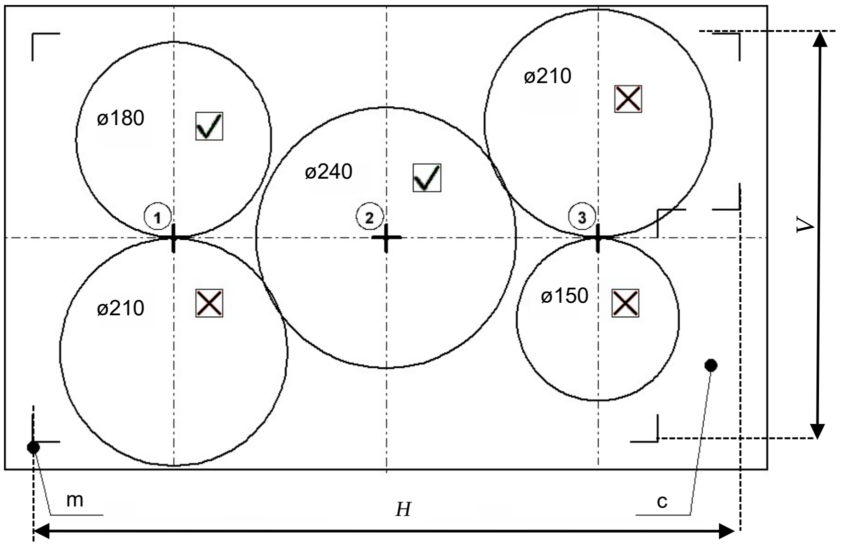
Key

c	area of the control
m	limitative marking of the cooking area
①,③	position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter
②	centre position of cookware with 240 mm diameter
☑	correct position
☒	wrong position, cookware has to be shifted

FIG. C-7 EXAMPLE 3: PROCEDURE HOW TO SHIFT THE COOKWARE INTO THE CORRECT POSITION – STEP 2

C-4 EXAMPLE 4 – COOKING AREA WITH LIMITATIVE MARKINGS >3 CONTROLS WITH THE AREA OF CONTROL AT THE SIDE

Dimensions in millimetres



Key

H	longest horizontal line of the marked cooking area
V	longest vertical line of the marked cooking area of the control
c	area of the control
m	limitative marking of the cooking area
①,③	position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm
②	diameter centre position of cookware with 240 mm diameter
☑	correct position
☒	wrong position, cookware has to be shifted

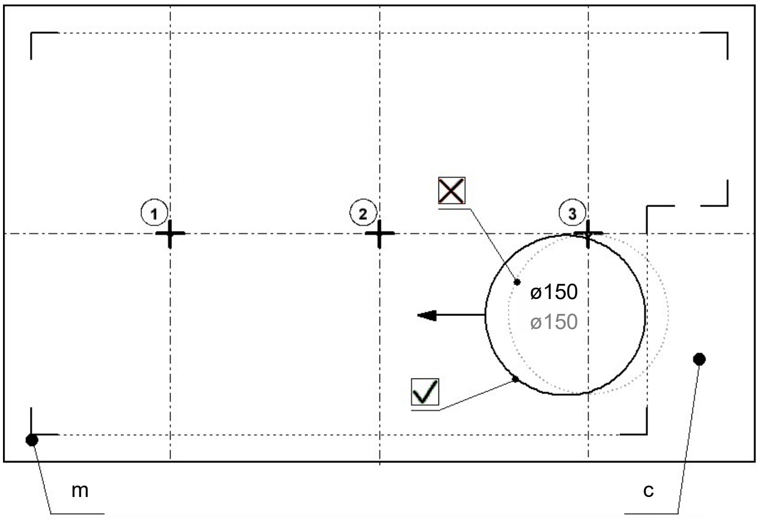
FIG. C-8 EXAMPLE 4: COOKING AREA WITH LIMITATIVE MARKINGS > 3 CONTROLS WITH THE AREA OF THE CONTROL AT THE SIDE

The 150 mm piece of cookware partially covers the area of the control, as does the piece of 210 mm cookware above the horizontal line; additionally, both pieces of cookware with a 210 mm diameter are outside the marked area (*see* Fig. C-8).

Correct the position of the pieces of cookware with 240 mm and 210 mm diameters as shown in example 4 in the following 2 steps:

1) Example 4: Move the 150 mm piece of cookware with horizontally until the area of the control is no longer covered (direction shown by arrow in Fig. C-9).

Dimension in millimetres



Key

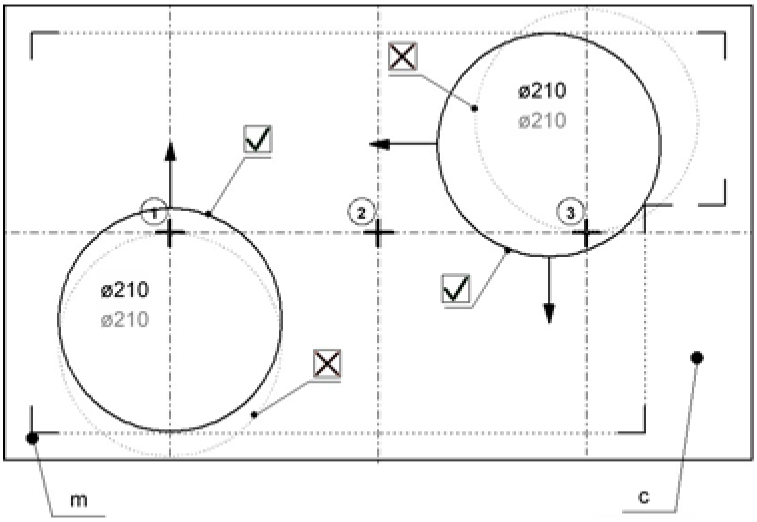
c	area of the control
m	limitative marking of the cooking area
①,③	position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter
②	centre position of cookware with 240 mm diameter
☑	correct position
☒	wrong position, cookware has to be shifted

FIG. C-9 EXAMPLE 4: PROCEDURE HOW TO SHIFT THE COOKWARE INTO THE CORRECT POSITION – STEP 1

2) Example 4: Move the piece of cookware (210 mm) above the horizontal line horizontally until the area of the control is no longer covered. Additionally, this piece of cookware is moved vertically until its entirety is within the marked area (*see* Fig. C-10).

For the piece of cookware (210 mm) below the horizontal line, a horizontal movement is not effective. Move this cookware vertically until the cookware is within the marked area.

Dimension in millimetres



Key

c area of the control
m limitative marking of the cooking area
①,③ position markers of the pieces of cookware with 150 mm, 180 mm and 210 mm diameter
② centre position of cookware with 240 mm diameter
☑ correct position
☒ wrong position, cookware has to be shifted

FIG. C-10 EXAMPLE 4: PROCEDURE HOW TO SHIFT THE COOKWARE INTO THE CORRECT POSITION – STEP 2

ANNEX D

(*Clause* 12)

SHADE CHART

Table D-1 specifies the relation between reflection value R_y and shade numbers.

Table D-1 Classification of Shade Numbers Regarding R_y

Sr. No.	**Measured Reflection Value *R*y**		**Tolerances** (*percent*)	**Shade Number**
	≥	<		
(1)	(2)	(3)	(4)	(5)
i.		7.2	± 14	17
ii.	7.2	9.3	±13	16
iii.	9.3	12.2	±12	15
iv.	12.2	16.4	±11	14
v.	16.4	20.1	±10	13
vi.	20.1	22.9	±10	12
vii.	22.9	26.5	± 9	11
viii.	26.5	31.7	± 9	10
ix.	31.7	38.5	± 8	9
x.	38.5	46.9	± 8	8
xi.	46.9	54.2	± 8	7
xii.	54.2	64.3	± 8	6
xiii.	64.3	75.2	± 8	5
xiv.	75.2		± 8	4

Table D-2 shows examples for the shade charts and their values for L^* and for the reflection value R_y. Additionally, the fourth column specifies the limiting samples for the colour measurement.

Table D-2 Examples for the Shade Charts Regarding L*, Ry and the Specification of the Limiting Samples H_{limit} and H_{lower}

NCS			
Shade Chart	L^*	R_y	**Limiting Sample**
S 8502-Y	30.3	6.4	
S 7020-Y50R	34.4	8.2	
S 6030-Y50R	38.6	10.4	
S 5040-Y40R	44.5	14.2	
S 4050-Y30R	50.4	18.8	
S 4040-Y30R	53.4	21.4	
S 4030-Y30R	56.6	24.5	
S 3040-Y30R	60.5	28.7	
S 2060-Y20R	65.7	34.9	
S 2040-Y20R	71.1	42.3	
S 1050-Y20R	77.1	51.7	
S 1040-Y20R	80.1	56.9	H_{lower}
S 0530-Y10R	88.1	72.3	H_{limit}
S 0520-Y10R	90.9	78.3	

NOTES

1 The measured reflection value R_y does not correlate linearly to the visual perception. Although the widths of the intervals given above increase with increasing reflection value R_y, visually the steps from shade number to shade number are fairly uniform.

2 R_y reflection values are calculated from the L^* values based on the CIE L*a*b* colour system (measuring conditions: standard illuminant D65/standard colorimetric observer CIE 1964/10°).

3 The NCS shade charts can be ordered at official NCS Centres all over the world. The following address shows a potential distributor.

Sweden (Head Office)
Scandinavian Colour Institute AB
Address: P.O. Box 49022, S -100 28 Stockholm
Internet: www.ncscolour.com
E-mail: info@ncscolour.com

ANNEX E

(*Clause* 10.5.4)

DATA AND CALCULATION SHEET: ENERGY CONSUMPTION OF A COOKING PROCESS (SEE CLAUSE 10 AND ANNEX A)

Brand & Factory:		**Hob Type / Model:**		**Testlab:**	
Rated Voltage:	V	**Supply Voltage:**	V	**Operator:**	
Rated Power:	kW	**Number of Controls:**		**Date:**	

Cooking Zone:		**Cooking Area:**		**Cookware Diameter:**	mm
Type of Cooking Zone:		**Without Limitative Marking:**	☐	**Water Load (M_{cw})**	g
Cooking Zone Dimension:	mm	**With Limitative Marking:**	☐	**Cookware Position:**	
				Cookware ID No.:	

Determine Tc According 10.5.2.1									
Sl. No.	**Ambient Air Pressure (hPa)**	**Ambient Temperature (°C)**	**Start Water Temperature (°C)**	**Time When Power Level is Switched off (min:s)**	**T70 (°C)**	**Highest Temperature Value (°C)**	**Overshoot ΔT_0 (°C)**	**Result Tc (°C)**	**Fixed Tc (°C) used**
							calc.	**calc.**	

Measuring energy consumption											
Sl. No.	**Ambient Air Pressure (hPa)**	**Ambient Temperature (°C)**	**Initial Water Temperature T_{15} (°C) acc. 10.5.1**	**$\bar{T}_c$ (°C) acc. 10.5.4.1**	**Continuous Power Level**	**Average Power (W) During t_s**	**t_{90} (min:s) $\bar{T}(t_{90})$ = 90 °C**	**E_{cw} Energy Consumption at t90 (Wh)**	**$\bar{T}_s$ (°C) acc. 10.5.4.1**	**Total Test Time (min:s) $t_{90} + t_S$**	**E_{cw} Energy Consumption (Wh) at $t_{90} + t_S$**

Energy consumption when using one cookware under test, normalized to 1 000 g water (Wh)	**calc.**

ANNEX F

(*Clauses* 8.6.1.1, 12.1.6.2, 12.1.2 and 14.2)

Addresses of suppliers

F.1 GENERAL

The following information is given for the convenience of users of this standard and does not constitute an endorsement. The information given below is indicative only and not exhaustive.

F.2 DISC MATERIAL (C45) FOR MEASURING THE SMALLEST DETECTED DIAMETER

(*see* Clause **14**)

ThyssenKrupp Schulte GmbH
Truderinger Str. 41
81677 München

F.3 STAINLESS STEEL FOR BOTTOM MATERIAL OF THESTANDARDIZED COOKWARE

(*see* Clause **8**)

Tad Inox Service B.V.
Ewald Renz Straße 1
76669 Bad Schönborn / Germany
http://www.tadinox.de

F.4 COOKWARE FOR MEASURING THE ENERGY CONSUMPTION ANDHEATING UP TIME

(*see* Clause **8** and Annex A)

RYBU GmbH
Allmendring 27
75203 Königsbach- Stein / Germany
http://www.rybu.de

F.5 DISC FOR MEASURING THE HEAT DISTRIBUTION

(*see* Clause **12**)

RYBU GmbH
Allmendring 27
75203 Königsbach- Stein / Germany
http://www.rybu.de

F.6LAMP FOR DIGITAL MEASUREMENT SYSTEMS

(see Clause **12**)

A possible supplier is:

Narva Typ Bio Vital 958
NARVA – Lichtquellen GmbH + Co. KG
www.narva-bel.de
office@nava-bel.de
Erzstraße 22
Germany 09618 Brand-Erbisdorf
Telephone: +49 37322/17200
Fax: +49 37322/17203

F.7 DIGITAL MEASUREMENT SYSTEM

(see Clause **12**)

1) Ziemann & Urban GmbH
Prüf- und Automatisierungstechnik
www.ziemann-urban.de
info@ziemann-urban.de

2) Ing.-Büro W. Neubauer
http://www.fpga-design.de
wn@fpga-design.de

F.8 TEST CHARTS FOR CHECKING THE RESOLUTION OF THE IMAGINGSYSTEM

(*see* Clause **12**)

Image Engineering GmbH & Co. KG
Dietmar Wüller. Uwe Artmann
Augustinusstraße 9d
Germany -50226 Frechen
http://image-engineering-shop.de
info@image-engineering.de

ANNEX G
(*Clause* 11)

EXAMPLE FOR ASSESSING THE LOWER CONTROL POSITION

G-1 GENERAL

Provided the measurement regarding **11.1** is conducted using standardized cookware, the following criteria are relevant.

G-2 CRITERIA

Entire maximum heating-up time: 45 min

1) First criteria: oil temperature ≤ 53 °C after 18 min.

   Empirical tests show that the chocolate is burned if the temperature is > 53 °C after 18 min.
2) Second criteria: oil temperature ≥ 40 °C after 30 min.

   Empirical tests show that longer melting times than 30 min are not acceptable.

If one or both of the criteria 1 and 2 are not fulfilled, the setting is considered as not adequate for applications such as the melting of chocolate.

3) Third criteria: (15 ± 1) min after the temperature of the oil reaches (50 ± 0.5) ºC, the oil temperature shall be ≤ 75 ºC.

   If (50 ± 0.5) ºC is never reached, the total test duration of 45 min is relevant.

If the third criterion is not fulfilled, the setting is considered as not adequate forapplications such as the melting of chocolate.

ANNEX H
(*Foreword*)

COMMITTEE COMPOSITION

Electrical Appliances Sectional Committee, ETD 32

Organization	*Representative(s)*
Central Electricity Authority, New Delhi	Shri Ashok Kumar Rajput (***Chairperson***)
BSH Household Appliances Manufacturing Private Limited, Chennai	Shri Balasubramanian Anand
BSH Household Appliances Manufacturing Private Limited, Chennai	Loganathan Vijay Kumar
Bajaj Electricals Limited, Mumbai	Shri Chandra Veer Singh Shri Socratees C. (*Alternate*)
Bureau of Energy Efficiency, New Delhi	Ms P. Samal Ms Deepshikha Wadhwa (*Alternate*)
CG Power and Industrial Solutions, Mumbai	Shri Mayur Nadkarni Shri Satyendra P. Singh (*Alternate*)
Central Electricity Authority, New Delhi	Shri O. P. Suman Shri Omkishore (*Alternate*)
Central Power Research Institute, Bengaluru	Shri D. Venkatesh
Central Public Works Department, New Delhi	Shri Mukesh Vij Shri A. K. Goel (*Alternate*)
Consumer Education and Research Centre, Ahmedabad	Ms. Shweta Mahajan
Consumer Electronics and Appliances Manufacturers Association (CEAMA), Noida	Shri Srinivasan Moturi Shri Suhas Kulkarni (*Alternate*)
Consumer Voice, New Delhi	Shri B. K. Mukhopadhyay
Defence Research and Development Organization, Research Centre Imarat, Hyderabad	Shri Prafulla Chandra Shri Suresh Chandra (*Alternate*)
Development Commissioner Micro-Small and Medium Enterprises	Shri S. Dharmaselvan
Dyson Technology India Pvt Ltd, Gurugram, Haryana.	Shri Shekh Tazimul Haque Faridi
Electrical Research and Development Association, Vadodara	Shri Rakesh Patel Shri Dr. Vinod Gupta (*Alternate*)
Electronics Regional and Test Laboratory (North), New Delhi	Shri Manjula Bhati
Government of Gujarat (IW), Energy and Petrochemical Department, Gandhinagar	Shri Mishra N.J.
Havells India Limited, Noida	Shri Rajeev Kumar Gupta Shri Pramod Deshpande (*Alternate*)
Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade, New Delhi	Shri S.K. Jain Mohd. Zakaria Khan Yusuf Zai (*Alternate*)
National Test House, Kolkata	Ms. Uma Bhakta Shri T. Roy Barman (*Alternate*)
National Water Mission Department of Water Resources, RD and GR Ministry of Jal Shakti, New Delhi	Shri Suneel Kumar Arora

Organization	*Representative(s)*
Petroleum Conservation Research Association, New Delhi	SHRI SURENDRA PRATAP SHRI P. K. PURKAYASHTA *(Alternate)*
Philips India Limited, Gurugram	SHRI VIVEK SHARMA SHRI VISHAL VIKRAM SINGH *(Alternate)*
Racold Thermo Limited, Pune	SHRI ABHIJIT BANSHELKIKAR SHRI RAVINDRA PATEL *(Alternate)*
UL India Private Limited, Bengaluru	SHRI V. MANJUNATH SHRI SATISH KUMAR *(Alternate)*
Venus Safety and Health Private Limited, Navi Mumbai	SHRI I. RAM KUMAR *(Alternate)* SHRI R.MURALI GANESAN *(Alternate)*
Whirlpool Corporation, Gurugram	MS. POONAM DAKE SHRI BALAJEE S PRASAD *(Alternate)*
In Personal Capacity	SHRI P. K. MUKHERJEE

Member Secretary
SHRI NITISH KUMAR JAIN
SCIENTIST 'B'/ASSISTANT DIRECTOR, BIS

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Bureau of Indian Standards

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